EVOLUTION SC

INK JET PRINTERS
INSTALLATION AND OPERATION MANUAL

digital design inc.
67 Sand Park Road
Cedar Grove, NJ 07009
(973) 857-9500
www.evolutioninkjet.com

Trend Marking Systems
PO Box 1311
Castle Hill, NSW, 1765, AUSTRALIA
(+61) 02-96299535
www.trendmarking.com.au

This manual is for use in operating and maintaining the EVOLUTION 1 Ink Jet Printer. This includes various optional features, which may not be included in your basic model printer. For basic start-up instructions, please refer to PART 1 Installation Procedures.

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ALL PRINT CARTRIDGES SUPPLIED BY DIGITAL DESIGN INC. ARE FACTORY TESTED AND PROFILED TO PRODUCE AN OPTIMUM AND CONSISTANT CODE. USING OTHER THAN AUTHORIZED CARTRIDGES WILL CAUSE UNDESIRABLE RESULTS.
EACH FLASH DATA CARD IS PROFILED EXPLICITELY FOR ITS' INTENDED PRINTER, AND IS SECURITY LOCKED PROHIBITING USE IN OTHER THAN THE ORIGINAL PRINTER FOR WHICH IT WAS PURCHASED. KEEP ALL UPGRADE CARDS IN A SECURE PLACE.
EVOLUTION 1 IS A BASIC MODEL WITH NO VARIABLE FIELD PROGRAMMING CAPABILITIES. OPTIONAL SOFTWARE MAY BE ADDED TO A BASIC UNIT AND IS COVERED IN THIS MANUAL.

INSTALLATION AND OPERATION MANUAL

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PART 1: INSTALLATION PROCEDURES

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INSTALLING THE EVOLUTION I PRINTING SYSTEM

Caution should be taken while installing the EVOLUTION I printing system on your equipment. Digital Design Inc. has taken every precaution to ensure a safe and accurate instruction set to guide the installer through the installation process. Follow the operational guidelines in the installation procedures.

VERIFY THAT YOUR EQUIPMENT IS IN PROPER OPERATING CONDITION.

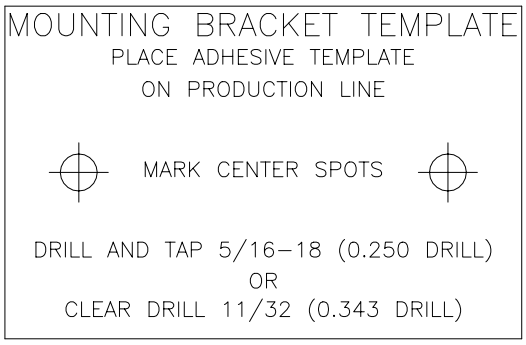
LOCATE A CONVENIENT POSITION ON YOUR EQUIPMENT. EVOLUTION I REQUIRES 4-1/2" OF SPACE ON THE PRODUCTION LINE.

FOLLOW THE INSTALLATION PROCEDURES.

READ CAREFULLY ALL INSTALLATION PROCEDURES BEFORE PROCEEDING.

INSTALL THE PRINTING SYSTEM ON YOUR EQUIPMENT. THERE IS NO EXTRA HARDWARE REQUIRED OTHER THEN THAT SUPPLIED IN THE INSTALLATION KIT.

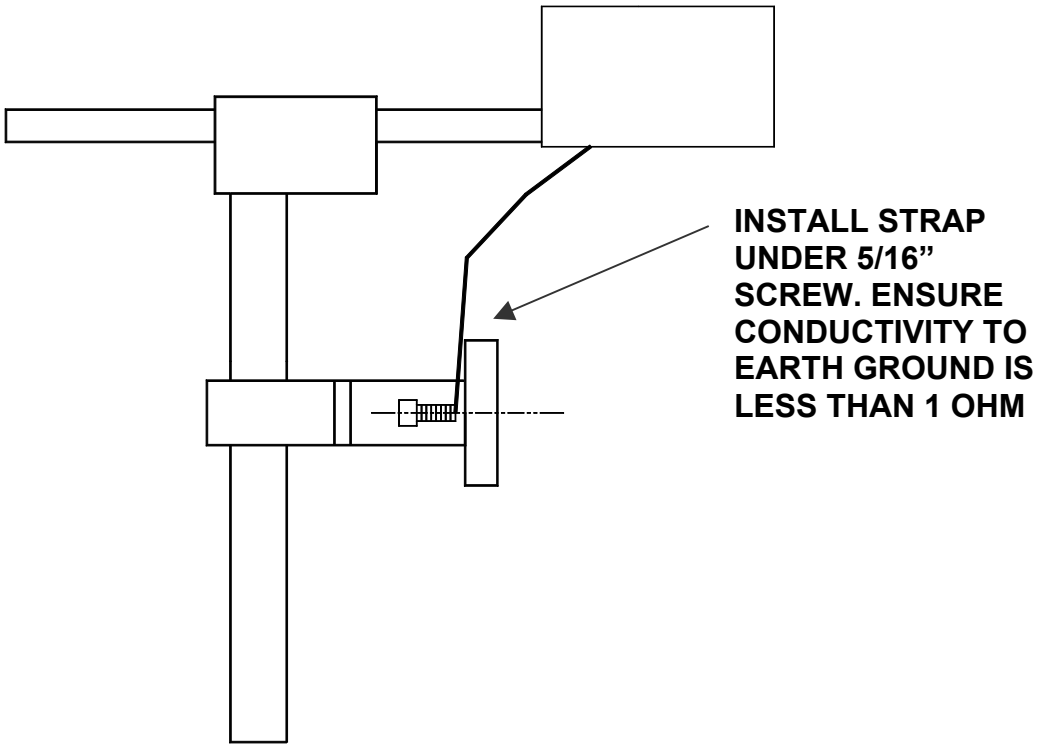
MOUNTING ON PRODUCTION LINE



Locate the supplied mounting template and affix in a convenient location on the production line. Spot and drill both mounting holes for a 5/16” bolt. NOTE: the user may also thread the side of the conveyer using a 5/16” tap.

Fasten the mounting bracket to the conveyer using the supplied mounting hardware and ensuring that the supplied ground strap is located securely beneath either of the two mounting bolts, and that conductivity to earth ground is less than 1 ohm. This ensures a proper path for static discharge, should the need arise.

GROUNDING STRAP INSTALLATION



INPUT POWER CONNECTION AND MODIFICATION

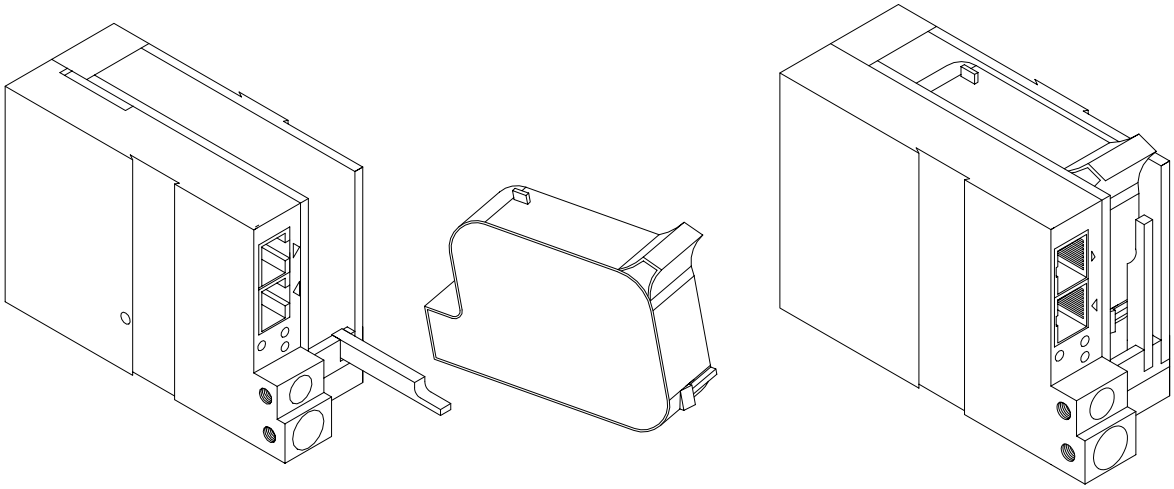
Insert the power plug to the available power source. The supplied power supply will is universal and will auto detect 100/240 VAC 50-60hZ.

No other adjustments are necessary.

INSTALLING THE PRINT CARTRIDGE

Remove the protective film from the face of the print head and retain the film. This protective film may be re-applied to store partially used cartridges. If it is necessary to remove the print head and store for a long period of time, it is best to re-apply the plastic film, and place the cartridge in a closeable plastic bag. Rotate the Print Head Release mechanism to the rear of the print head so that it is free for insertion of the print cartridge. Push the print cartridge in and down to insert it into the print carriage. Gently lift the locking arm and press forward against the print cartridge. A snap will be felt as the locking mechanism presses the cartridge into the correct position.

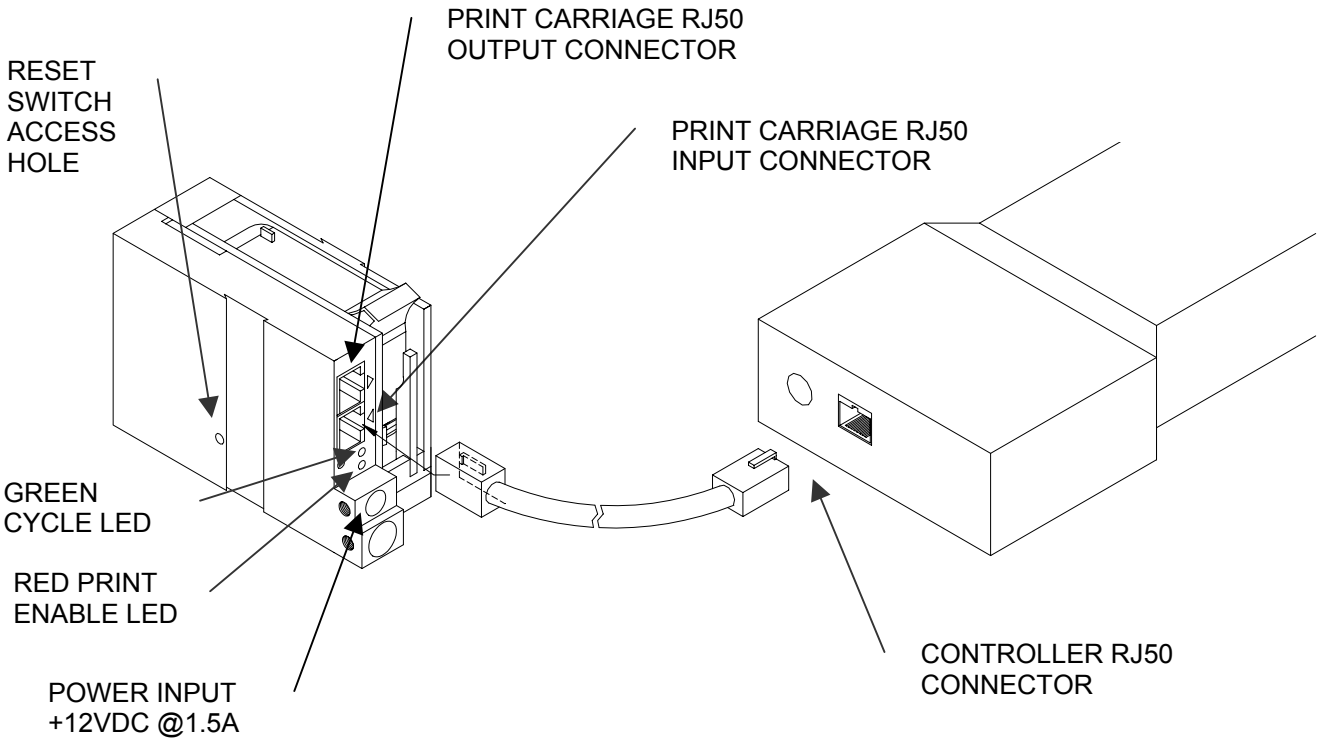
NOTE: EACH PRINT CARTRIDGE HAS BEEN PROFILED AT THE FACTORY. THIS PROCEDURE DETERMINES THE OPTIMAL OPERATING CHARACTERISTECS FOR EACH INDIVIDUAL CARTRIDGE. USING ANY OTHER PRINT CARTRIDGE WILL HAVE UNDESIRABLE RESULTS.



NOTE: WHEN A NEW CARTRIDGE IS INSTALLED, BOTH THE RED AND GREEN LIGHT WILL FLASH TWICE INDICATING A CORRECT INSTALLATION. THE USER MUST REMEMBER TO RESET THE INK LEVEL UNDER THE F4 FUNCTION KEY.

CONNECTING THE CONTROLLER TO THE CARRIAGE

Connect the Controller to the print carriage using the supplied 3 FT (.9 mm) interconnect cable C21008-3 supplied with the Printing System. The cable is a standard RJ50 (10 conductor). Longer cables are available as required.
Connect either end of the cable to the Carriage Assembly and securely lock in place. **NOTE: THE CONNECTOR MUST BE PLUGGED INTO THE INPUT RJ50 CONNECTOR LOCATED ADJACENT TO THE LED'S AND MARKED WITH AN ARROW POINTING TO THE CONNECTOR**. A click will be heard when the connector is in the appropriate position. Connect the free end to the Controller Assembly and ensure connector is securely seated.



CAUTION:
NOTE ORIENTATION OF THE CONNECTORS. DO NOT FORCE CONNECTORS INTO POSITION SECURELY LATCH (CLICK) INTO POSITION.
CONTROLLER MUST PLUG INTO THE PRINT CARRIAGE RJ50 INPUT CONNECTOR FOR PROPER OPERATION. THE PRINT CARRIAGE RJ50 OUTPUT CONNECTOR IS USED EITHER FOR CONNECTION TO THE NEXT PRINTER ON A NETWORK OR FOR EXTERNAL PRODUCT OR EXTERNAL ENCODER INPUT.
THE POWER INPUT CONNECTOR MUST BE SECURELY INSERTED INTO THE PRINT CARRIAGE. UPON PROPER INSERTION BOTH THE RED AND GREEN LED'S WILL FLASH INDICATING PROPER CONNECTION.

CONFIGURING THE PRINTER

To verify the current operating software press the STOP PRINT key.
Press the V key

```
CONTROLLER 7.08
PRINTER 2.08J
PRINTER SN XXXXXX
EXIT ANY KEY
```

The first line indicates the version of the controller software
The second line numerics indicate printer software version and the letter is the firmware version of the printer. The '+' (s) following indicate options installed:

```
+ _ _ _    = Option 1
_ _ + _    = Option 1.5
+ _ + _    = Option 1 and Option 1.5
+++ _      = Option 2
++++       = Option 3
```

The third line indicates the serial number of the printer

SYSTEM RESET

There are two types of resets available in the Evolution printing system. The first type of reset is a SOFT RESET.

```
ERASE STORED
MESSAGES
YES OR NO  Y/N
```

Depressing the R key while applying power to the unit will display the reset command mode
CAUTION: A response of Y will delete all stored messages.

```
RESET PRINT HEAD

YES OR NO  Y/N
```

The next screen to appear prompts the user to determine if a print head is to be restored to its default value.
CAUTION: ALL PRINT HEADS CONNECTED TO THE CONTROLLER WILL BE RESET TO FACTORY DEFAULT CONDITIONS. THIS INCLUDES RESETING EACH UNIT ADDRESS TO 1. TO PREVENT THIS REMOVE ALL INTERCONNECTED PRINT HEADS EXCEPT FOR THE UNIT TO BE RESET FROM THE DATA LINK.

```
ALL HEADS
     WILL BE RESET
CONTINUE = X KEY
ANY OTHER EXITS
```

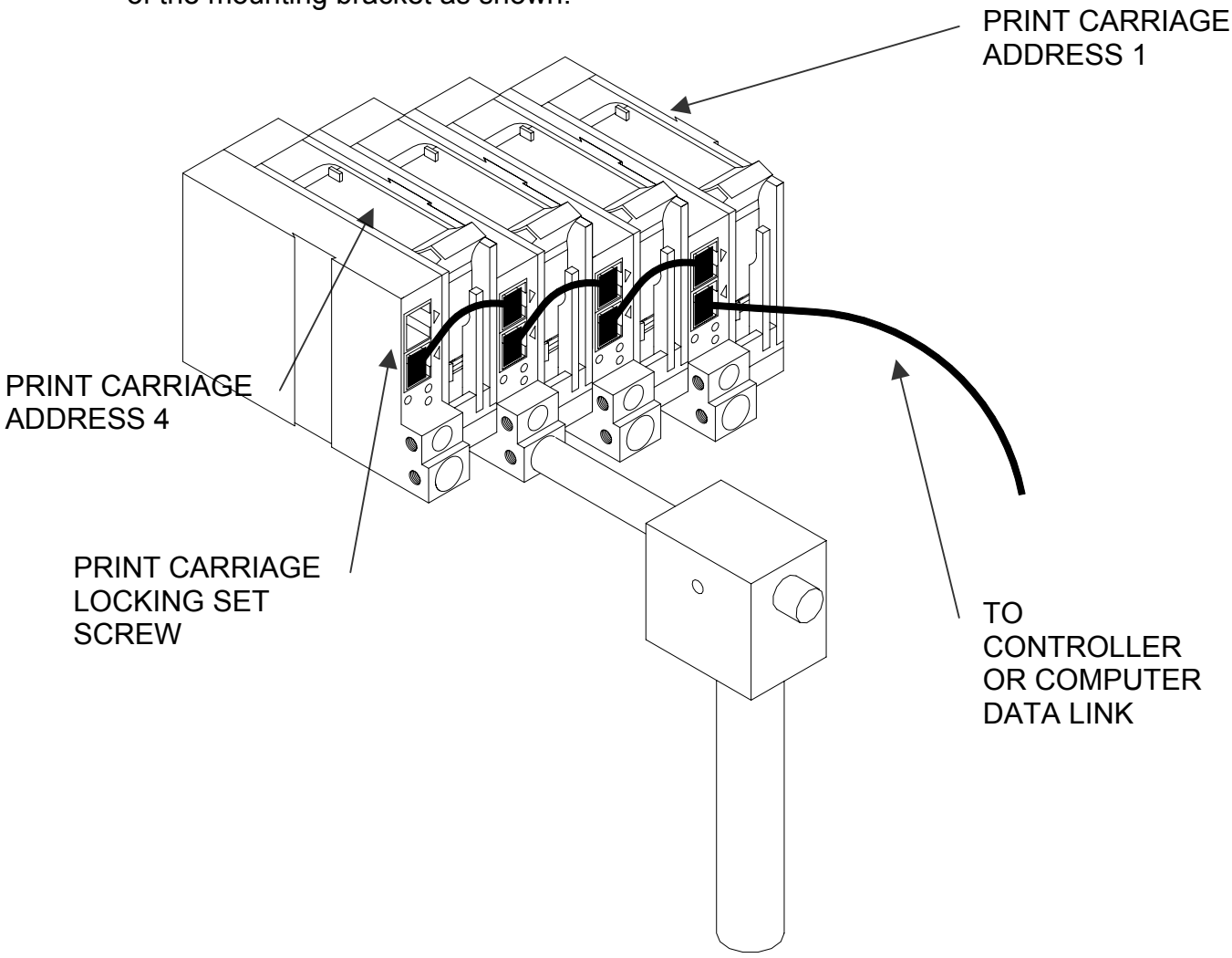
The second reset is a hard reset. Disconnect the power cable. Insert a standard paper clip into the hole on the female dovetail side of the cabinet, and while holding the paper clip in place (a light click will be felt) re-apply the power connector.
This operation will reset the print carriage assembly to the factory default settings and clear any current message.

MULTIPLE PRINT HEADS

EVOLUTION I printing systems have the ability to reside on a network. The network may contain from 1 to 32 print carriages connected via RJ50 cables. These cables are available in varying lengths depending on the application.
Each mounting bracket can support up to 4 print carriages and would typically interconnect with a 6" RJ50 data cable.

NOTE: Please address each unit individually as per page 2-17 prior to daisy chaining the printers. Special care must be taken to connect the output of the first print carriage to the input of the next print carriage.

When connecting multiple print carriages place no more than 2 stations on a side of the mounting bracket as shown.


PRINT CARRIAGE ADDRESS 1
PRINT CARRIAGE ADDRESS 4
PRINT CARRIAGE LOCKING SET SCREW
TO CONTROLLER OR COMPUTER DATA LINK

EVOLUTION I QUICK START

STOPPED **HD 1- - >SPEED=120** **EVOLUTION 1**

Connect the printer carriage to the appropriate power source.
Connect the controller to the carriage assembly. The controller derives power from the carriage.

On startup the LCD will display as pictured.

CHANGING LANGUAGE PROMPTS

< - - SELECT - - > **ENGLISH**

Press the F4 key [F4] and select [1] for LANGUAGE. Use the [◀] [▶] keys to select the desired language and press the [↵] to select the language.

ENABLING PRINT MODE

PRINTING **HD 1- - >SPEED=120** **EVOLUTION 1**

Press the GREEN PRINT key [□···] to start printing

HEAD SELECT MODE

STOPPED **HD 1- - >SPEED=120** **EVOLUTION 1**

< - - SELECT - - > **WHICH HEAD = 1**

NO RESPONSE   **ANY KEY TO EXIT**

The hand held controller can program up to 32 print carriages on an RS485 data link. The factory default sets each print carriage to **ADDRESS 1.** Selection of another print head other than ADDRESS 1, press the key. Use the [◀] [▶] keys to select the alternate print carriage number and press the [↵] key. The print carriage whose address was selected will respond with the current message and appropriate parameters.

As an added convenience using the [◀] [▶] will auto scan to find the next available head connected to the environment

Accessing an address not associated with any print carriage will result in a no response message.

ENTERING A MESSAGE

STOPPED **HD 1- - >SPEED=120** **EVOLUTION 1**	Press the GREEN PRINT key The LCD display will change from PRINTING to STOPPED.
MESSAGE ENTRY **FONT 1 LINE** **EVOLUTION 1**	Press the GREEN EDIT key
MESSAGE ENTRY **FONT 1 LINE**	Press the BLUE F3 key F3 to delete the entire message
MESSAGE ENTRY **FONT 1 LINE** **EXP 12/10/04**	Press the BLUE FONT key to select the desired font size and enter the text EXP 12/10/04 Press the ENTER key to end the MESSAGE EDIT mode
PRINTING **HD 1- - >SPEED=120** **EXP 12/10/04**	Press the GREEN print enable key to enter the print mode

STORING A MESSAGE (OPTION PACK 1, 1.5, 2 OR 3)

STOPPED **HD 1- - >SPEED=120** **EXP 12/10/04**	Press the GREEN STOP PRINT KEY **Note: In option pack 1 there is a maximum of 50 messages stored. Option pack 1.5 increases message storage to 99 messages.**
MESSAGE # 1 **PLEASE WAIT**	Press the RED MESSAGE STORE key The LCD display will display the message storage screen
MESSAGE # 1 **MESSAGE STORED** **EXP 12/10/04**	Use the or to select the desired storage location Press the RED MESSAGE STORE KEY a second time and the current message appears in the selected location and is stored.
STOPPED **HD 1- - >SPEED=120** **EXP 12/10/04**	Press the ENTER key to return to the command prompt.

LOADING A MESSAGE ((OPTION PACK 1, 1.5, 2 OR 3)

STOPPED **HD 1- - >SPEED=120** **EVOLUTION 1**	Press the GREEN STOP PRINT KEY **Note: In option pack 1 there is a maximum of 50 messages stored. Option pack 1.5 increases message storage to 99 messages.**
MESSAGE # 1 **PLEASE WAIT**	
MESSAGE # 1 **EXP 12/10/04**	Press the RED MESSAGE STORE key and use the or keys to select the desired message
STOPPED **HD 1- - >SPEED=120** **EXP 12/10/04**	and press the ENTER key
PRINTING **HD 1- - >SPEED=120** **EXP 12/10/04**	Press the GREEN print enable key to enter the print mode

EVOLUTION I QUICK SETUP

Install a new cartridge. Press the following keys in order:

REMAINING INK
100 %
C NEW CARTRIDGE
OTHER KEY EXIT

To reset the ink level detector press

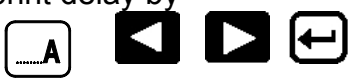
Each time a new print cartridge is installed the system automatically profiles the correct operating parameters for the new cartridge. These parameters set the required voltage and on time to produce consistent results without user intervention..

NOTE: USING OTHER THAN AUTHORIZED CARTRIDGES MAY CAUSE UNDESIRABLE RESULTS.

Press the GREEN print enable key to enter the print mode

To set the LINE SPEED, press to put the system in the Printing mode. Set character width by

To set the PRINT DELAY press: to put the system in the Printing mode. Set print delay by



. NOTE: Each increment or decrement changes the delay by the pre-defined amount.

You may continue to experiment with line speed and print delay until the desired code registration on the product is achieved.

PART 2: OPERATION PROCEDURES

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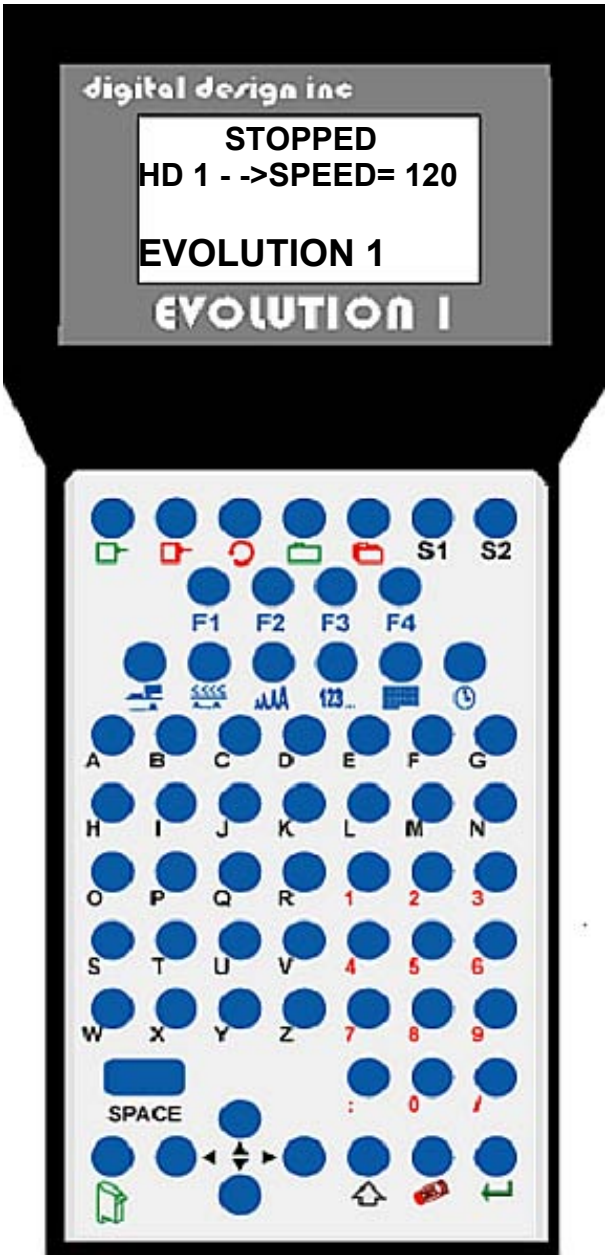
OVERVIEW
CONTROLLER AND LCD

The keypad on the print station, pictured here, contains 64 keys. The LCD will display various messages to assist in programming on the upper half of the display. The lower half of the display will show up to two lines of the entered print message.

The 4 keys on the top row are the function keys F1 through F4. They each consist of submenus for modifying various printer functions. Their specific menus are detailed later in this section.

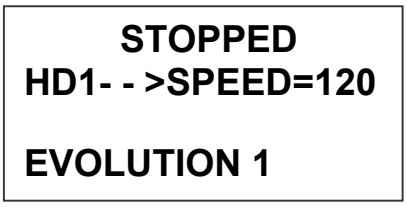
.



KEYPAD KEY DESCRIPTIONS

	This is the manual cycle key. When in the Stopped mode, pressing this key causes the printer to print one code
	This is the Print key. Use it to place the unit in the Print mode
	This is the Purge key. Use it to purge ink for maintenance purposes. The unit must be in the Command mode to use this key.
	This is the Head Select key. Use it to select the address of the head to be communicated with.
	Use this arrow to decrease values, and use it to move the cursor in the message line while editing the message.
	Use this arrow to increase values and use it to move the cursor in the message line while editing the message.
	Use this arrow to move the cursor between the message lines while in Edit mode and building a message.
	Use this arrow to move the cursor between the message lines while in Edit mode and building a message.
	This key is the Message Storage key. Use it to store and to recall individual codes.
	This is the Delete key. Use it to backspace to delete a character when mistyped as well as to exit from certain menus.
	This is the Message Entry key. Use this key to enter the Message Entry mode, to input a code or to edit a code.
	This is the Date key. Use this key to enter the Date in Message Entry Mode. (OPTION PACK 2). Change Date in STOPPED mode.
	This is the Time key. Use this key to enter the Time in Message Entry Mode. (OPTION PACK 2). Change Time in STOPPED mode.
123...	This is the Sequence Number key. Use this key to enter the Sequence Number in Message Entry Mode. (OPTION PACK 2)
	This is the Enter or Return key. When pressed, the unit will accept input and exit certain menus.
	This key selects the Print Delay in COMMAND mode and Offset Date in EDIT mode (OPTION PACK 3)
	This key selects the Line Speed in COMMAND mode and the shift code in the EDIT mode (OPTION PACK 3)
	This key selects the Font size in the EDIT mode. In the COMMAND mode pressing this key displays the current fonts loaded in the print head.
S1	Pressing this key while in the Message Entry mode accesses special characters
S2	This key is reserved for special customer Logos

TURNING ON THE PRINT STATION FOR THE FIRST TIME



To turn the print station on insert the power jack into the DC power connector.

There is no on/off switch.

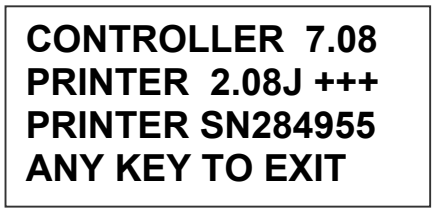
The first time the print station is turned on, as received from the factory, the LCD will look like the illustration on the left. Each line gives important information regarding the system:

The Top line indicates the operating mode of the unit: “STOPPED” when in Command mode, “ PRINTING” when in Print mode, and “MESSAGE ENTRY when in message entry.

The 2nd line shows the print head currently selected, the direction of travel for the product and the programmed SPEED.

The lower half two lines of the display shows the message entered for printing. This may represent one or two lines of code.

CHECKING SYSTEM INFORMATION



Verify system information by pressing the V key on the hand held controller keyboard. The LCD screen will display the software, firmware, serial number and options enabled. Enabled options are indicated on the second line as a series of + characters where the first + indicates option pack 1, the second + indicates option pack 1.5 and the last + indicates option pack 2.

CHECKING LOADED FONTS

Press the FONT AAA key in the COMMAND mode to check what fonts are currently loaded in the print head.

CHANGING SYSTEM DATE (OPTION PACK 2 INSTALLED)

PRESENT SETTING
ANY CHANGES Y/N
01/04/00

When the unit is in the STOPPED mode pressing the DATE key allows the user to change the system date. If there are no changes press the N key to return to the STOPPED mode.

PRESENT SETTING
ANY CHANGES Y/N
01/04/00
ENTER MONTH-

Press the Y key to change the date.
The system will prompt the user first for the Month (enter 2 digits), then the Day (2 digits) and finally the year (2 digits).

PRESENT SETTING
ANY CHANGES Y/N
04/23/05

After the data is entered the system displays the currently entered date and pressing the N key returns the user to the STOPPED mode, or press Y to the correct the date.

CHANGING SYSTEM TIME (OPTION PACK 2 INSTALLED)

PRESENT SETTING
ANY CHANGES Y/N
23:05

Select the N key if the time is correct and return to the STOPPED mode.

PRESENT SETTING
ANY CHANGES Y/N
23:05
ENTER HOURS -

Press the Y key to change to the correct time. Enter the correct hours (2 digits) followed by the correct minutes (2 digits). The screen displays the corrected time. Press the Y key to make further changes or N key to return to the STOPPED mode.

PRESENT SETTING
ANY CHANGES Y/N
13:50

Notice the time is in 24-hour format.

PROGRAMMING

DEFINITIONS

There are two parts to programming the EVOLUTION I ink jet printer,

- Setting the operations parameters, (character width, delay, etc.) and
- Building the message.

MODES OF OPERATION

The system operates is 3 basic modes. They are: Print Mode, Command Mode, and Message Entry Mode.

In Print Mode the majority of the keys on the keypad are disabled to avoid inadvertent changes. When in Print Mode the Top line of the LCD will display **PRINTING.**

The Command Mode is used to change the functions of the printer. When in the Command Mode the display will show **STOPPED** on the top line.

The Message Entry Mode is used to create or modify printable codes, when in this mode the top line of the display will show **MESSAGE ENTRY**.

PRINT MODE AND STOPPED "COMMAND" MODE

PRINTING **HD1- - >SPEED=120** **EVOLUTION 1**

When in the Print mode the screen will look like the screen on the left. When PRINTING is seen on the LCD, the unit will print as product passes in front of the carriage assembly. To enter Print mode, press .

STOPPED **HD1- - >SPEED=120** **EVOLUTION 1**

When in the Command Mode the screen looks like the illustration at left. When STOPPED the printer will not print when product is moved past the carriage assembly.
In Command mode, access can be made to the menus under the function keys, **F1** through **F4** icon control keys plus access to Message Entry Mode. To enter Command mode, press .

MENU STRUCTURE

In the Command mode, access is allowed to the menu structure for basic parameters. The menus reside within the function keys, **F1** through **F4**. In order to select one of the parameters, press the number key that corresponds to the desired parameter.

F1

The **F1** key, when pressed, brings up the menu as shown below.

1=CHAR. SPACING
2=EXT. ENCODER
3=DATE OFFSET

#3 VALID IN OPTION PACK 3 ONLY

F2

The **F2** key, when pressed, brings up the menu as shown below.

1=DIRECTION
2=PRINT INVERSE
3=PRODUCT DETECT
4=AUTO REPEAT

F3

The **F3** key, when pressed, brings up the menu as shown below.

NOT AVAILABLE

ANY KEY TO EXIT

SCREEN WITHOUT OPTION PACK 2 OR 3 INSTALLED

1= PRODOCT COUNT
2= SHIFT CODE
3=DATE FORMAT
4=TIME FORMAT

#1 VALID IN OPTION PACK 3 ONLY
#2 VALID IN OPTION PACK 3 ONLY
#3 VALID IN OPTION PACK 2 OR 3
#4 VALID IN OPTION PACK 2 OR 3

F4

The **F4** key, when pressed, brings up the menu as shown below.

1=LANGUAGE
2=INK SUPPLY
3=SET UNIT I.D.
4=LOAD CARD

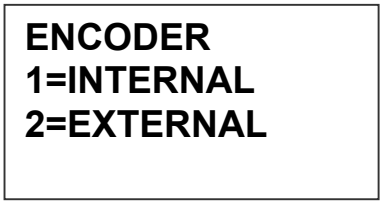
F1 MENU

Place the unit in the Command mode and press F1. The screen shown to the left is produced. Press the correct number to make changes to that parameter. Those selections designated as NOT AVAILABLE will not respond to selection. They are reserved for future system expansion.

1 = CHARACTER SPACING:

This parameter controls the amount of space between characters in the code. Spacing can be varied from 1 to 25 columns. Use this control to make printed codes more legible when code is compressed. Press the 1 then press ▶ or ◀ to change the value. Press ↵ once the desired value is displayed.

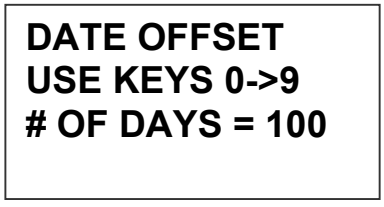
2 = EXT. ENCODER:



Press 1 to select internal time base. This parameter controls the source of the time base used for printing. Each vertical column printed requires a signal necessary to produce a character representative of the line speed of the production line. The printer can be set to produce a perfect aspect ratio character (300 dpi vertical and horizontal) or compressed by setting the print head line speed faster than the actual line speed, or expanded by changing the internal speed slower than the actual line speed.

In the event there is an acceleration or deceleration to the production line, or there is a requirement to guarantee accurate aspect ratio, such in the case of barcodes, an external encoder is necessary. Press 2 to select external encoder. While external encoder is selected the LINE SPEED key will adjust the expansion and compression of the printed message. NOTE: WHEN PRODUCING BARCODES IT IS NECESSARY TO PRODUCE A PERFECT ASPECT RATIO CHARACTER.

3 = DATE OFFSET: (OPTION PACK 3 ONLY)



This selection is only available with option pack 3 installed. This allows the user to preset the number of days used in the date offset calculation to a maximum of 999 days. The format of the date offset can be different than a normal date and may be set with the F3 #3 option DATE FORMAT.

F2 MENU

```
1=DIRECTION
2=PRINT INVERSE
3=PRODUCT DETECT
4=AUTO REPEAT
```

Place the unit in the Command mode and press F2. The screen shown to the left is produced. Press the correct number to make changes to that parameter
NOTE: OPTION 4 ONLY APPEARS IF OPTION PACK 1 IS INSTALLED

1 - DIRECTION:

```
< - -  SELECT  - - >
LINE DIRECTION

        < - - - -
```

The arrow shown on the LCD's third line screen should agree with the direction of product travel. Press ▶ or ◀ to change direction. Press ↵ for the unit to accept the change.

2 - PRINT INVERSE:

```
CODE ORIENTATION
1 = NORMAL PRINT
2 = UPSIDE DOWN
```

This parameter allows the code to print right side up or upside down. Pressing 2 will produce the following screen. Press 1 for normal print or 2 for upside down codes. Save the choice by pressing ↵. Look for the change of direction on the imprint.

3 – PRODUCT DETECT:

```
PRODUCT DETECT
1 = INTERNAL
2 = EXTERNAL
```

This menu selection allows the user to select the source of the product detect feature. Press 1 to use the internal product detect sensor located at the front of the print carriage just below the print cartridge. If it becomes necessary to sense a portion of the product not directly in front of the print head then an external product detect sensor must be used. This setting also allows the EVOLUTION I to be controlled from other sources, like a PLC. When external product detect is selected the user must also change the jumper option within the print head. Refer to the OPTION SELECT section for proper use.

4 - AUTO REPEAT: (OPTION PACK 1, 2 OR 3)

< - - SELECT - - > **REPEAT TIME= 0**

This option enables the unit to continuously print repeated codes at specified time intervals along the entire length of the product. A time of 0 disables the Auto Repeat option. Use ◀ or ▶ to change the repeat time. Each number in the time delay adds or subtracts a distance equivalent to the pre-defined setting. Save your choice by pressing ↵.

F3 MENU

This menu is reserved for system expansion.

```
NOT AVAILABLE


ANY KEY TO EXIT
```

WITH OPTION PACKS INSTALLED

1 – PRODUCT COUNT: (OPTION PACK 3 ONLY)

```
1= PRODUCT COUNT
2= SHIFT CODE
3=DATE FORMAT
4=TIME FORMAT
```

Press **F3** to change the product count feature. Each of the following screens prompts the user to enter the desired format.
NOTE: this is not a printable field.

```
   PRODUCT COUNT
CHANGES Y / N OR C
08:00 - - > 16:00
COUNT = 000000
```

Enter Y to change the product count start and end times or N to abort. If the counter is to be cleared enter the letter C

```
   PRODUCT COUNT
START TIME
08:00 - - > 16:00
ENTER HOURS-
```

Selecting Y prompts the user to enter the desired hours-starting time.
NOTE: all times are entered in military time

```
   PRODUCT COUNT
START TIME
08:00 - - > 16:00
ENTER MINUTES-
```

The next screen prompts for the start time minutes.

```
   PRODUCT COUNT
END TIME
08:00 - - > 16:00
ENTER HOURS-
```

Next the user enters the ending hours time.
NOTE: all times are in military time.

```
   PRODUCT COUNT
START TIME
08:00 - - > 16:00
ENTER MINUTES-
```

Finally, the ending time minutes are entered.
The product count feature is a non-printable value and may only be accessed via this menu function. It will accumulate product counts each day until the value is cleared using the C key at the start of the menu option.

2 – SHIFT CODE: (OPTION PACK 3 ONLY)

```
1= PRODUCT COUNT
2= SHIFT CODE
3=DATE FORMAT
4=TIME FORMAT
```

```
ADJUST SHIFTS
< - -  SELECT  - - >
SHIFT  1  07:00  A
ANY CHANGES Y/N
```

The shift code option allows the user to enter 6 different shift times per day. Use the arrow keys to select a shift and enter a Y to change a shifts start time.

```
ADJUST SHIFTS
     SHIFT 1
START TIME
ENTER HOURS -
```

Enter the shift starting hours.
Note: all times are in military format

```
ADJUST SHIFTS
     SHIFT 1
START TIME
ENTER MINUTES -
```

The next screen prompts for the shift starting minutes.

```
ADJUST SHIFTS
     SHIFT 1

PRINT CODE -
```

Finally, enter the desired code required to represent a shift. This may be any alpha/numeric field. This field will automatically increment with each shift change.

NOTE: TO DISABLE A SHIFT ENTER A SPACE CHARACTER IN THE PRINT CODE FIELD. THE SHIFT TIMES WILL BE DISPLAYED AS --:-- FOR ALL DISABLED SHIFT TIMES.

3 – DATE FORMAT: (OPTION PACK 2 OR 3)

```
1= NOT AVAILABLE
2= NOT AVAILABLE
3=DATE FORMAT
4=TIME FORMAT
```

Press **F3** to change the date formatting. Each of the following screens prompts the user to enter the desired format for printing.

```
   CHANGE FORMAT
1=CALENDAR DATE
2=OFFSET DATE
```

When option pack 3 is installed the user has the option of selecting a different date format for the normal printed calendar date and the printed date offset. Select 1 or 2 to alter the appropriate date field.

```
    MONTH FORMAT
1=NUMERIC
2=LETTERS
```

Selecting the standard numeric format will prompt the user to enter the format of the date in standard number format.

```
     DATE FORMAT
D=DAY      M=MONTH
Y=YEAR     J=JULIAN
dm/dd/dy
```

The default as shipped from the factory is dm/dd/dy, and may be modified as required.
If the offset format was selected the word **DATE** is replaced with the word **OFFSET.**

```
     DATE FORMAT
D=DAY      M=MONTH
Y=YEAR     J=JULIAN
jjj
```

```
     DATE FORMAT
D=DAY      M=MONTH
Y=YEAR     J=JULIAN
jjjyy
```

To change the format press the delete key and the last line on the display will be erased. The entire format will be erased and must be re-entered.
Press either of the designator keys (ie M for month) and the display will display the correct code for the item selected. As an example enter the Julian date and year. Press the J key followed by the Y key. The code entered will print the Julian date followed by the 2-digit year. Notice no delimiters were selected, but may have been entered by selecting the appropriate key on the keyboard. Press the Enter key to return to the STOPPED mode.

```
    MONTH FORMAT
1=NUMERIC
2=LETTERS
```

Alpha characters may have bee selected by pressing option 2.

DATE FORMAT D=DAY M=MONTH Y=YEAR jjjyy

Delete the current formatting by pressing the Delete key.

NOTE: DELIMITER CHARACTERS LIKE A / CODE MAY BE ENTERED TO SEPARATE FIELDS

DATE FORMAT D=DAY M=MONTH Y=YEAR ddmmmyy

Enter the desired Date Format and notice when the M (month) is selected the display shows mmm. Select the appropriate key on the keyboard by entering in the desired code. Press the Enter key to return to the STOPPED mode.

4 – TIME FORMAT: (OPTION PACK 2 OR 3)

1= NOT AVAILABLE 2= NOT AVAILABLE 3=DATE FORMAT 4=TIME FORMAT

Change the Time Format by selecting option 4.

NOTE: Delimiter characters like a : code may be entered to separate fields

TIME FORMAT H=HOURS M=MINUTES hh:mm

The factory default for time formatting is hh:mm and may be changed as required. Press the Delete key and the last line on the display is erased.

TIME FORMAT H=HOURS M=MINUTES hh

Enter the desired format by pressing the H and or M keys, and select delimiters as required. Select H if only hours are required.
Press the Enter key to return to the STOPPED mode.

F4 MENU

```
1 = LANGUAGE
2 = INK SUPPLY
3 = SET UNIT I.D.
4 = LOAD CARD
```

Place the unit in the Command mode and press F4. The screen shown at left is produced. Press the number that corresponds to the parameter you wish to change.

1 - LANGUAGE:

```
< - -   SELECT   - - >

        ENGLISH
```

Press 1 and the screen will change like the one on the left. The default language is English; the other choice is Spanish. Scroll through the choices using either ◄ or ►. Once the desired language is shown on the screen, press ↵. This will return the unit to the Command mode. Whenever language is chosen, all prompts and commands shown on the screen will be in that language.

2 - INK SUPPLY:

```
REMAINING INK
      100
C NEW CARTRIDGE
ANY KEY TO EXIT
```

The second line of the display shows the percentage of ink remaining in the print cartridge.

Each time a new cartridge is installed the user must reset the system ink gauge by pressing the **C** key.

When a C is entered the system automatically profiles the operating conditions for the new cartridge.

Each cartridge is tested and profiled at the factory eliminating the burden of personalizing each cartridge by the user. There are a number of tasks associated with print cartridge profiling, as each print cartridge differs from another. The correct drive voltage, pulse width timing and pre-fire pulse warming must be calculated for optimum operation.

NOTE: USING NON-AUTHORIZED CARTRIDGES MAY PRODUCE UNDESIRABLE RESULTS

3 – SET UNIT I.D.:

< - - SELECT - - > **SET HEAD # = 1**

Each print carriage can contain a unique address to distinguish multiple carriages when controlled by a single hand held controller or computer data link using an RS485 data link. The default for each new print carriage module is ADDRESS 1. Addresses can range from 1 to 32. It is advisable when adding multiple print carriages to affix a label indicating the unique ADDRESS number of the individual carriage. To program a carriage it must be connected directly to the hand held controller, with no other carriages connected.

4 – LOAD CARD:

LOADING FONTS (MENU SELECT 1)

```
EXECUTE LOADER
1=LOAD FONTS
2=LOAD LOGOS
3=LOAD OPTIONS
```

The user can replace the existing FONT, add up to six logos, or load optional software from a Data Flash card, which is plugged into the top of the print carriage. Select 1 to load a different font to replace the current system font.

```
LOAD FONT
1= LOAD DEFAULTS
2= LOAD ALTERNATE
```

The screen to the left will appear and after a few seconds a result will be displayed to indicate NOTHING LOADED or the name of the newly loaded font, logos or software upgrades.

```
LOAD RESULTS
PLEASE WAIT
```

To load or replace the current LOGOS in the system press the 2 key. Similar to loading FONTS the screen at the left will appear indicating the load results.

```
MEMORY ERROR
NO FLASH CARD

ANY KEY TO EXIT
```

This screen will be displayed if the data flash card is either not present or cannot be read.
CHECK THAT THE DATA FLASH CARD IS PROPERLY INSTALLED

```
LOAD RESULTS
2 LINE fontname
1 LINE fontname
ANY KEY TO EXIT
```

A successful load will display the current font names loaded into the print head. This screen will be displayed when the default fonts are loaded.

```
LOAD RESULTS
2 AF fontname
1 AF fontname
ANY KEY TO EXIT
```

When loading alternate fonts the AF will replace LINE for the alternate font or fonts loaded.

LOADING LOGOS (MENU SELECT 2)

```
EXECUTE LOADER
1=LOAD FONTS
2=LOAD LOGOS
3=LOAD OPTIONS
```

The user can replace the existing FONT, add up to six logos, or load optional software from a Data Flash card, which is plugged into the top of the print carriage. Select 2 to load logos into the print head.

```
EXECUTE LOADER
PLEASE WAIT
```

```
MEMORY ERROR
NO FLASH CARD

ANY KEY TO EXIT
```

This screen will be displayed if the data flash card is either not present or cannot be read.
CHECK THAT THE DATA FLASH CARD IS PROPERLY INSTALLED

```
LOAD RESULTS
2 LINE  1  2  3
1 LINE  1  2  3
ANY KEY TO EXIT
```

Displaying the number of logos as indicated in the pictorial indicates successful loading.
The display indicates the number of logos loaded for the 1 line or 2 line mode.

LOADING OPTIONS (menu select 3)

```
EXECUTE LOADER
1=LOAD FONTS
2=LOAD LOGOS
3=LOAD OPTIONS
```

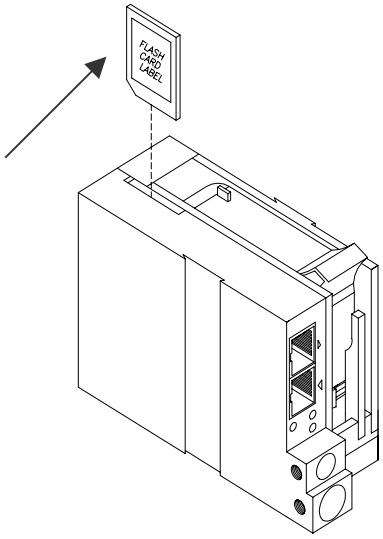
Optional software may be added via Data Flash Card to the basic unit to add features.

NOTE: when optional software is loaded into the system the Data Flash Card is encoded with the serial number of the unit and is valid only for the unit in which the software was loaded.

```
CONTROLLER  7.08
PRINTER  2.08I ++++
PRINTER SN284955
ANY KEY TO EXIT
```

Verify system information by pressing the V key on the hand held controller keyboard. The LCD screen will display the software, firmware, serial number and options enabled. Enabled options are indicated on the second line as a series of + characters where the first + indicates option pack 1, the second + indicates option pack 1.5 the third is option pack 2 and the last + indicates option pack 3.

NOTE: THE FIGURE BELOW SHOWS THE CORRECT ORIENTATION FOR INSERTING THE DATA FLASH CARD.



INSERT THE DATA FLASH CARD INTO THE SLOT PROVIDED AT THE TOP OF THE PRINT CARRIAGE AS SHOWN. NOTE THE ORIENTATION OF THE LABEL ON THE CARD. PRESS THE CARD COMPLETELY INTO THE SLOT. THE CARD SHOULD BE REMOVED AFTER USE AND STORED IN A SAFE PLACE. ONCE LOADED (FONTS & OPTIONS) THE CARD IS SECURITY LOCKED WITH THE SERIAL NUMBER OF THE PRINTER CARRIAGE AND WILL NOT OPERATE IN ANOTHER PRINT CARRIAGE.

NOTE:

There are two fonts loaded into the EVOLUTION printer at any one time. Loading a new font will overwrite the existing font or fonts. Print starts at the bottom nozzle of the print head (dot 150 for line 2) and at the middle of the print head (dot 75 line 1). The printer is shipped with a 1/2" font (FONT1 for a single line of print) and a 7/32" font (FONT0 for two lines of print). The 1/2" font may be replaced with other than a 1/2" tall character. Alternate fonts that are loaded replace the existing fonts. Inserting a data flash card containing alternate fonts and cycling the power will temporarily use the alternate fonts on the data flash card until the card is removed and either the power is cycled or the print station is set to the STOPPED mode. This eliminates the need to load the alternate font using the LOAD CARD option.

SETTING PRINT DELAY AND LINE SPEED

LINE SPEED – This setting adjusts the width of the printer message on the product. This setting should be adjusted to produce the desired print on the product. Line speed can be increased or decreased to stretch or compress the message to fit the desired print area.

PRINT DELAY – This setting adjusts the location of the printed message on the product.

```
     STOPPED
HD1- - >SPEED=120

EVOLUTION 1
```

Access to these parameters is possible when the unit is in either the STOPPED or PRINTING mode as shown to the left.

```
     PRINTING
HD1- - >SPEED=120

EVOLUTION 1
```

Pressing the A delay key allows the user to determine the amount of print delay. Each count at a normal aspect ratio is approximately 0.060". This will vary according the amount of compression or expansion used.

SETTING LINE SPEED

```
< - -  SELECT  - - >
LINE SPEED =  100
```

Normally, the system will be set to use the internal time base for line speed control. The default value is 100, which creates a normal width character on a line moving at 100 ft per min. The print can be narrowed by increasing the number and widened by decreasing the number. Pressing A A accesses this parameter. Once pressed, a new screen appears, as shown to the left. Changes can now be made by using ◀ or ▶. The range of values for character width is 1 to 200. Once the desired number is chosen, press ↵ to save your entry.

```
< - -  SELECT  - - >
ENCODER DIV = 4
```

If external encoder is enabled and the unit is in the PRINTING mode the user has the option of adjusting the compression ratio of the printer message. Changes may be made by using ◀ or ▶. Once the desired number is chosen, press ↵ to save your entry.

SETTING PRINT DELAY

STOPPED **HD1- - >SPEED=120** **EVOLUTION 1**

Print delay is used to position a message on the product at a location other than at the leading edge. Access this parameter by pressing on the keypad.

NOTE: This parameter may be set when the unit is either in the PRINTING or STOPPED mode

PRINTING **HD1- - >SPEED=120** **EVOLUTION 1**

< - - SELECT - - > **PRINT DELAY= 100**

To change the value use either or . The range of values for this parameter is 1 to 255. Each increment represents 18 columns, approximately .060" (1.5mm). Therefore, a delay of 255 would approximate 15.3" (388mm). Once a number is chosen, press to save the entry. NOTE: THE DIMENSION INDICATED IS WHILE PRINTING A PERFECT ASPECT RATIO CHARACTER. WHEN PRINTING A COMPRESSED OR EXPANDED CHARACTER THE ACTUAL DIMENSIONAL NUMBER WILL BE DIFFERENT BUT CAN BE ESTIMATED BASED ON THE 18 COLUMNS PER COUNT.

NOTE: Setting the line speed first, then adjusting the print delay may prove to be the best starting point

INPUT, EDIT OR DELETE MESSAGES

```
      STOPPED
HD1- - >SPEED=120

EVOLUTION 1
```

To input, delete or edit a message, the unit must be in the STOPPED Mode. If the LCD reads PRINTING, press . The screen should be similar to the one shown at the left.

```
 MESSAGE ENTRY
      FONT  1 LINE

EVOLUTION 1
```

Enter the Message Entry mode by pressing . The top portion of the screen will change as shown on the left.

```
 MESSAGE ENTRY
      FONT  1 LINE
```

The user has two options to edit or change a message. If a new message is to be entered press the F3 key to delete the entire existing message.

```
 MESSAGE ENTRY
      FONT  1 LINE

EXP 12/01/2004
```

For example, to produce a single line of 1 LINE. Press until the 1/2 " font size is shown, and enter EXP 12/01/2004.
The message shown to the left would be an example if the 1 LINE font were used.

```
 MESSAGE ENTRY
      FONT  2 LINE
BEST BY
EXP 12/01/2004
```

To place two lines use the to select 2 LINE size. Press the F3 to delete the entire message. Press the or to select which line the data will be entered on. Enter BEST BY. The pictorial at the left shows two lines of 2 LINE character size. To enter and print only 1 line of 2 LINE select the line and enter data to that line only.
Once the message line(s) is complete, save the change by pressing .

```
      STOPPED
HD1- - >SPEED=120
BEST BY
EXP 12/01/2004
```

```
MESSAGE ENTRY
     FONT  1 LINE

EXP 12/01/2004
```

The second option is to replace characters by using the key or moving the cursor over a character to be replaced. When the MESSAGE ENTRY mode is entered the cursor is placed at the end of the line. Pressing the key will delete the last character on the line. Successive 's will continue to delete the last character on a line.
At the left the characters 4 0 0 2 / 1 were deleted.

```
MESSAGE ENTRY
     FONT  1 LINE

EXP 12/0
```

```
MESSAGE ENTRY
     FONT  1 LINE

EXP 12/05/2005
```

Enter the correct data, in this case 5/2005.

```
MESSAGE ENTRY
     FONT  1 LINE

EXP 12/15/2004
```

The alternative approach if just a few characters are to change is to use the or to place the cursor over the characters to be changed and retype the correct characters. In this example the 01 was changed to 15.

```
< - -   SELECT   - - >
!#$&( )*+=¢■ŇÉÕ
```

Symbols are inserted by pressing S1. When in Message Entry mode, position the cursor where a symbol is needed and press S1. The screen will show a line of symbols as presented on the left. Position the cursor by pressing or on the special character to be inserted and press .

```
      STOPPED
HD1- - >SPEED=120

EVOLUTION 1
```

Continue to build the message or press to return to the Command mode.

PASSWORD PROTECTION (OPTION PACK 1 OR 2)

The EVOLUTION I contains a password function designed to limit access to the edit menu and prevent unauthorized changing of message lines. To activate this function, switch the unit off, then press and hold [P] while switching the unit on. The display changes and requests the default password (which is 12345). Enter the 12345.

The screen to the left appears and prompts the operator or ENABLE PASSWORD
A response of N maintains the current password and disables password protection.

If the response Y is selected the screen at the left appears to prompt the user to enter a new password. Enter the new 5 character password any combination of letters and numbers may be used. Once this has been completed, the unit will not allow message editing without the entry of the password.

If the new password is misplaced or forgotten, reset the unit.

MESSAGE STORAGE (OPTION PACK 1, 1.5 OR 2)
STORING A MESSAGE

MESSAGE # 1

All EVOLUTION I printers are able to store up to 50 system wide programmed messages and their associated parameters. Follow these steps to store a message. Create the message and press ↵. Press 🗀. Using ◀ or ▶, scroll to the desired message location number.

MESSAGE # 1 **PLEASE WAIT**

Press 🗀 a second time. This places the message into that numeric location for recall at a later time. Use the same procedure to overwrite an existing stored message as well.

MESSAGE # 1 **MESSAGE STORED** **EVOLUTION 1**

The LCD display will indicate that the message is stored.

Press MENU to exit.

NOTE: Message storage should be used after the product has been coded satisfactorily. When a message is stored all operating parameters of the printed code are saved. Once recalled, codes will be printed the same as they had been before.
Option pack 1 enables the user to store up to 50 messages in the hand held controller. With option pack 1.5 or 2 the controller is capable of storing up to 99 messages.

RECALLING A STORED MESSAGE

MESSAGE # 1 **EVOLUTION 1**

Place the unit in “Stopped” mode and press 🗀.
Use the ◀ or ▶ to scroll through the stored messages. Find the desired message and press ↵. That message is now displayed on the screen ready for printing.

STOPPED **HD1- - >SPEED=120** **EVOLUTION 1**

PART 3: MAINTENANCE PROCEDURES

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PERIODS OF SHUTDOWN

SHORT PERIODS OF SHUT-DOWN

When the printer has been shut down overnight, the system might require a purge to clear out dust particles that have settled on the nozzle area during non-use. This is only necessary if there are missing dots in the printed code on product.

STOPPED **HD1- - >SPEED=120** **EVOLUTION 1**

To purge be sure that the unit is in the STOPPED Mode by pressing green key. The screen changes to STOPPED as shown to left.

PURGING **HD1- - >SPEED=120** **EVOLUTION 1**

Place a piece of lint free wipe (or absorbant paper) in front of the print head and press the red . Allow the unit to purge for several seconds. There is an automatic shut down after 1,000 printed columns to ensure that the print head will not be damaged. If ink residue has solidified on the nozzle area a small drop of water may be applied to the lint free wipe.
When purging is complete the LCD will be returned to the STOPPED mode.

STOPPED **HD1- - >SPEED=120** **EVOLUTION 1**

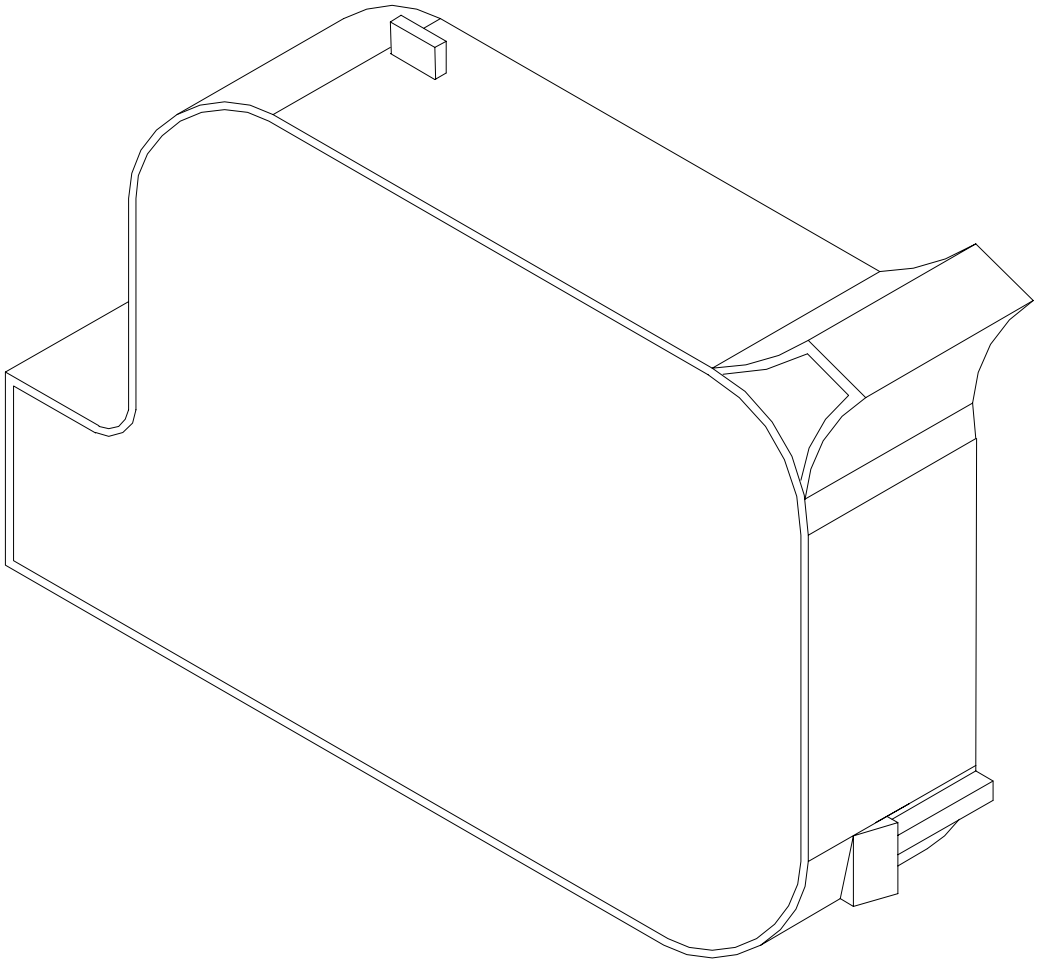
PRINTING **HD1- - >SPEED=120** **EVOLUTION 1**

Press the green and the screen changes to PRINTING, as shown at the left. The unit is ready to begin coding.

LONG PERIODS OF SHUT-DOWN

When the printer is to be shut down for extended periods, or the ink cartridge needs to be changed to insert a different color cartridge, the ink cartridge should be removed.
Clean the print head nozzle area with a soft, lint free wipes and insure there is no ink residue remaining on the nozzle area. Re-apply the sealing tape. The print cartridge may be stored in a sealable plastic bag.

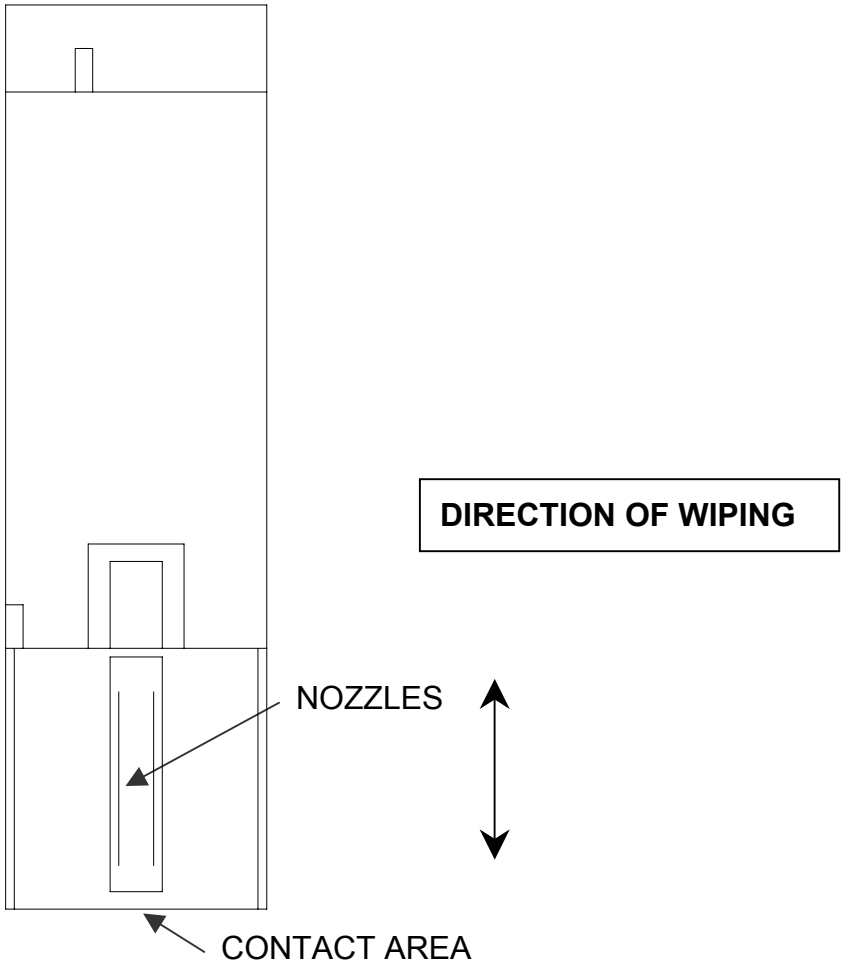
CAUTION: USE THE ORIGINAL SEALING TAPE SUPPLIED WITH THE EVOLUTION I INK CARTRIDGE. DO NOT USE ANY OTHER MATERIAL OR ANY ADHESIVE BACKED PRODUCT, AS THIS WILL DAMAGE THE NOZZLE AREA.



PRINT CARTRIDGE MAINTENANCE

It is necessary to maintain the EVOLUTION I print cartridge free from accumulated dust and debris. Periodically the cartridge should be removed and cleaned. This is totally dependent on the operating environment and the average printable life of the ink cartridge. In extremely dusty environments, this maintenance procedure may be required regularly.

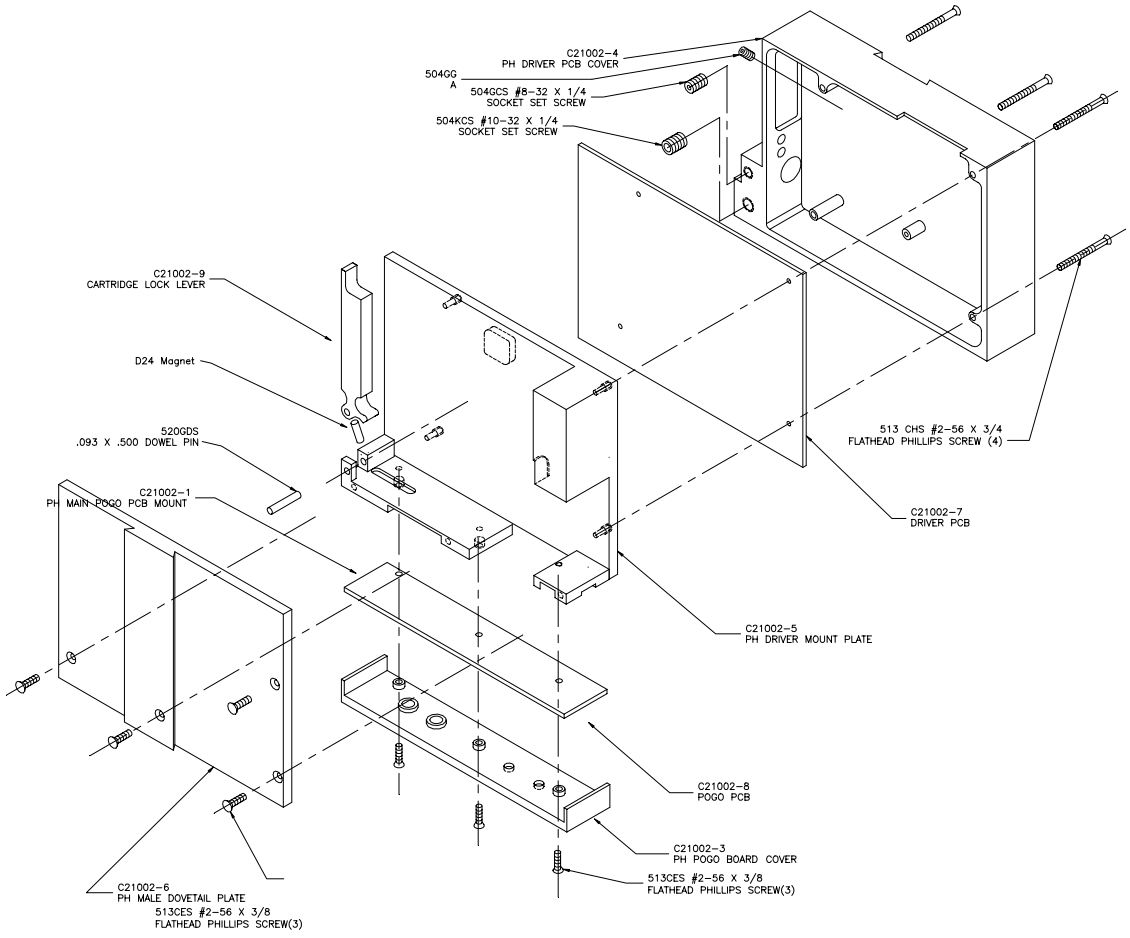
To clean the cartridge, carefully clean the face of the cartridge with a soft, lint free wipe. Use caution in wiping the NOZZLE area so as not to scratch the face. Always wipe in the ARRAY PLATE vertically as indicated.
Clean the CONTACT area in a similar fashion.



PRINT CARRIAGE MAINTENANCE

It is necessary to maintain the print head carriage free from accumulated dust and debris. Periodically the print head carriage should be inspected and cleaned. This is totally dependent on the operating environment. In extremely dusty environments, this maintenance procedure may be required occasionally but on average every week should be sufficient.
Remove the print cartridge and carefully inspect the print carriage C21001 for dust and debris.
Re-insert the print cartridge and place the unit into the PRINTING mode by pressing .

EXPLODED VIEW OF THE C21002 PRINT CARRIAGE



PART 4: TROUBLESHOOTING AND REPAIRS

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- LCD remains blank 4-2
- Unit does not print, although LCD shows information 4-2
- Low ink indicator on with full ink cartridge 4-2
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- Unit loses data while printing 4-2

FAULTS

This chart was created to assist the user in troubleshooting the unit. Find the problem in the first column; apply the remedy(s) suggested in the third column.

Condition	Probable Cause	Remedy
LCD remains blank.	No power.	Ensure the controller is securely connected to the correct port on the print carriage assembly
Unit does not print, although LCD shows information.	No message in unit	Input your message (see pages 2-18).
	Unit in "COMMAND" mode.	Press .
	No ink.	Replace ink cartridge; reset ink volume parameter (press F4 and follow the sequence.
Low ink indicator on with full ink cartridge.	Did not reset ink volume parameter.	Press F4. Continue key entry following menu prompts.
Unit does not purge.	Out of ink.	Replace with full ink cartridge. Reset ink volume parameter (press F4).
	Unit in "PRINTING" mode	Press Stop Print.
	Ink cartridge clogged	Clean Ink Cartridge Nozzle area with lint free wipe
Missing one or more dots from code.	No ink.	Clean or Replace cartridge and purge system (press).
	Long down-time.	Follow daily start-up procedure if your line experienced a long down time.
Unit loses data while printing	Static electricity	Eliminate source of static. Attach ground strap between print head and low impedance earth ground.
	High levels of radio frequency.	Move unit to an alternate location or attach ground strap as above.
	Spikes in electrical line.	Use AC line filter

PART 5: PARTS LIST AND OPTIONS

Part No.	Description
	SPARE PARTS
C21001-1	EVOLUTION I Controller Cabinet
C21001-2	EVOLUTION I Controller LCD Assembly
C21001-3	EVOLUTION I Controller PCB Assembly
C30238	EVOLUTION I Controller Keypad
C21002	EVOLUTION I Print Head Carriage Assembly
C21002-7	EVOLUTION I Print Head Carriage CPU Assembly
C21002-8	EVOLUTION I Print Head Carriage POGO Assembly
C21005	EVOLUTION I Mounting Bracket Assembly
C21000-2	EVOLUTION I Power supply
	OPTIONS
96280-01	Floor stand
C21003	Top Coding Mounting Bracket
C21006	External Product Detect
C21007	External Encoder
C21012	Optional Junction Box
EV1-SW1	Option Pack 1 Password, Message Store, Auto Repeat
EV1-SW1.5	Option Pack 1.5 Expanded Message Length
EV1-SW2	Option Pack 2 (Option Pack 1 & 1.5) & Time, Date, Sequential Number
EV1-SW3	Option Pack 3 (Option Pack 2) & Date Offset, Shift Code, Product Count
EV1-FONT	Alternate Font (Specify when ordering)
EV1-LOGO	Logo Option (Specify when ordering)
	CABLES
C21008-1	EVOLUTION I RJ50 Cable 6 INCH
C21008-3	EVOLUTION I RJ50 Cable 3 Feet
C21008-10	EVOLUTION I RJ50 Cable 10 Feet
C21008-25	EVOLUTION I RJ50 Cable 25 Feet
C21008-50	EVOLUTION I RJ50 Cable 50 Feet
C21008-100	EVOLUTION I RJ50 Cable 100 Feet

INKS

4500BK6	6 Pack of Black Ink Cartridges
4500RD6	6 Pack of Red Ink Cartridges
4500GR6	6 Pack of Green Ink Cartridges
4500BL6	6 Pack of Blue Ink Cartridges
4500YW6	6 Pack of Yellow Ink Cartridges
4500CY6	6 Pack of Cyan Ink Cartridges
4500UV6	6 Pack of Ultra Violet Ink Cartridges

4600BK6	6 Pack of Black Ink Cartridges (SEMI-POROUS)

PART 6: COMMUNICATIONS PROTOCOL

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- Baud Rate 6-2
- Definitions 6-2
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DESCRIPTION

This communication protocol is Version 1.4 and was released NOV 2005 and is used with all EVOLUTION products. The communications option converses with a host computer via an RS485 data link.

NOTE: EACH REQUEST OR COMMAND SENT TO A PRINT STATION RECEIVES A RESPONSE FROM THAT PRINT STATION. COMMUNICATIONS SOFTWARE MUST WAIT FOR A RESPONSE TO DETERMINE IF THE PRINT STATION WAS READY TO ACCEPT THE COMMAND, AND THE DATA WAS VALID AND PROCESSED. NO RESPONSE COULD INDICATE THE DATA WAS LOST. IF AN ERROR WAS DETECTED IN PROCESSING A NAK WITH AN ERROR CODE IS RETURNED.

DATA WORD DEFINITION

Full Duplex - 7 Data Bits - 1 Even Parity Bit - 1 Start Bit - 1 Stop Bit

BAUD RATE

115,200 Bits per second

DEFINITIONS

Q=QUERY TO HEAD
R=RESPONSE FROM HEAD
D=DATA UPDATE TO HEAD
X=ACK FROM HEAD
'!'=ASCII CHARACTER OR CHARACTERS
0x21 HEX DATA EQUIVELENT
ADDRESS= TWO ASCII REPRESENTATIONS OF HEX CHARACTERS

CABLING FOR EVLINK ENVIRONMENT

C20552 RS232C to RS485 converter module
C20551 Cable from PC to RS485 converter module
C21008-xxxx Cable (define length) from EVOLUTION units to RS485 data link
C21009 Termination plug for RS485 data link

HARDWARE INTERFACE

When connecting multiple print carriages via an RS485 link, input and output connectors are provided on the print station, which allows the cabling to be daisy chained. NOTE: It is important to remember to set each of the print stations to a unique address.

PHYSICAL CONNECTIONS RS485 PRINT CARRIAGE

Pin # 4	= Receive +
Pin # 5	= Receive -
Pin # 6	= Transmit +
Pin # 7	= Transmit -
Pin # 9	= Ground

Note: At the end of the data link a termination plug is installed to balance the RS485 data link.
This termination plug connects pin 4 to pin 5 and pin 6 to pin 7. This adds a 120-ohm termination resistor across the data lines.

PROTOCOL FORMAT:

Host request for information;

ESC|Command|SOH|EOT (Single End Host to 1 printer)

Or

ESC|STX|Address|Command|SOH|EOT (Multiple printers)

Host sending new information;

ESC|Command|Data|EOT (Single End Host to 1 printer)

Or

ESC|STX|Address|Command|Data|EOT (Multiple printers)

Evolution Printable Character Set

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
0 1 2 3 4 5 6 7 8 9
Special Symbols:

ASCII Character	Hexadecimal	Prints As
Space	(0x20)	Space
!	(0x21)	Hour Glass
#	(0x23)	#
$	(0x24)	$
&	(0x26)	&
(	(0x28)	(
)	(0x29)	)
*	(0x2a)	*
+	(0x2b)	+
-	(0x2d)	-
.	(0x2e)	Period
=	(0x3d)	=
:	(0x3a)	:
/	(0x2f)	/
"	(0x22)	Cents
%	(0x25)	Solid block
;	(0x3b)	Ň
?	(0x3f)	Ě
@	(0x40)	Ó
{	(0x7b}	Logo 1
|	(0x7c)	Logo 2
}	(0x7d}	Logo 3

NOTE: ALL OTHER CHARACTERS ARE ILLEGAL AND MUST NOT BE SENT TO THE PRINT HEAD.

SOFTWARE PROTOCOL

In the following pages, all references to characters or digits pertain to the standard ASCII character set. The | (bar) character is used as a field separator and it is not part of the transferred data. When data is shown in hexadecimal, it will consist of the hex number followed by an H, for example (1BH). All packets to and from a print station begin with an ESC (1BH) and terminate with an EOT (04H).

There are two types of commands:

The first sends information to the print station and the second requests information from the print station.

To distinguish the two types of commands, a SOH (HEX 01) is placed after the command byte in a request command string. The following illustrates this concept:

To download data to print station
ESC/GROUP ADDRESS/UNITADDRESS/COMMAND/DATA/EOT

To request data from the Print Station
ESC/GROUP ADDRESS/UNITADDRESS/COMMAND/SOH/EOT

NOTE: EACH REQUEST OR COMMAND SENT TO A PRINT STATION RECEIVES A RESPONSE FROM THAT PRINT STATION. COMMUNICATIONS SOFTWARE MUST WAIT FOR A RESPONSE TO DETERMINE IF THE PRINT STATION WAS READY TO ACCEPT THE COMMAND, AND THE DATA WAS VALID AND PROCESSED. NO RESPONSE COULD INDICATE THE DATA WAS LOST. IF AN ERROR WAS DETECTED IN PROCESSING A NAK WITH AN ERROR CODE IS RETURNED.

ERROR CODES

Commands to a print station, if completed successfully, return a single byte response of an ASCII ACK (06H). If the command was not successful, a two-byte response of an ASCII NAK (15H) is returned, followed by an error code.
Below is a list of the returned error codes.

NAK 1	= Transmission Error
NAK 2	= Illegal Command Byte
NAK 3	= Trying to print while in command mode
NAK 4	= Trying to read a write only register
NAK 5	= Trying to write a read only register
NAK 6	= Print station buffer full must print before next download to clear buffer.
NAK 7	= Print station busy with user interaction through local keyboard (i.e. in edit mode).
NAK 8	= Print station busy.

COMMANDS:

'!' 0x21 Software Version (read only)

Q. ESC|STX|Address|`!`|SOH|EOT
R. ESC|STX|Address|`PRINTERxxxxxyyyy`|CR|EOT
Where:
PRINTER= ASCII word PRINTER
xxxxx = Software and Firmware versions
(e.g. 2.02H indicates version 2.02 with Firmware version H)
yyyy = Optional Software loaded
Where:
The first y indicates option pack 1
The second y indicates option pack 2
The third y indicates option pack 1.5
The last y indicates option pack 3
The presence of an option pack is indicated by the character + (&h2B)
The absence of an option pack is indicated by an ASCII SPACE (&h20)

'\' 0x5c Unit Serial Number

Q. ESC|STX|Address|`\`|SOH|EOT
R. ESC|STX|Address|`\`|`serial number`|CR|EOT

'B' 0x42 Set Unit Address (Write Only)

D. ESC|STX|Address|`B`|`xy`|EOT
X. ESC|STX|Address|`B`|ACK|EOT
Where: xy = 8 bit unit address
i.e. x = 31 & y = 35 yields unit address 15

'#' 0x23 Printer Configuration (read only)

Q. ESC|STX|Address|`#`|SOH|EOT
R. ESC|STX|Address|`#`|`xy`|EOT
Where: Byte x Bits 3,2,1,0
Bit 3 = if 1 Cartridge Not Valid
Bit 2 = Not Used
Bits 1,0 = System Type
11 = Evolution 1
10 = Evolution 2
01 = Evolution 3
00 = Evolution 4
Where: Byte y Bits 3,2,1,0
0000 = no options available
0001 = option1 enabled
0010 = option2 enabled
0100 = option3 enabled

'r' 0x52 Remaining Ink (0 to 99%)

Q. ESC|STX|Address|`r` |SOH|EOT
R. ESC|STX|Address|`r`|`ab`|EOT
Where 'ab' is a percentage

ESC|STX|Address|'r'|0|0|EOT **Resets the ink level**

'1' 0x31 Auto Repeat Inter-print delay (0 - 255) – OP1/2/3

Q. ESC|STX|Address|`1`|SOH|EOT
R. ESC|STX|Address|`1`|`ab`|EOT

D. ESC|STX|Address|`1`|`ab`|EOT
X. ESC|STX|Address|`1`|ACK|EOT
0 = Auto Repeat Disabled and each count provides a delay equal to 18 columns of print.

'8' 0x38 Control Flags

Q. ESC|STX|Address|`8`|SOH|EOT
R. ESC|STX|Address|`8`|`xy`|EOT
Where x bits 7,6,5,4,
y bits 3,2,1,0
Bit 0 1 = Enable print mode
Bit 1 1 = Direction forward
Bit 2 1 = External Product Detect
Bit 3 1 = External Encoder
Bit 4 1 = Head busy purging
Bit 5 1 = Head busy manual cycle
Bit 6 1 = Print image inverted
Bit 7 1 = Head busy printing message

D. ESC|STX|Address|`8`|`xy`|EOT
X. ESC|STX|Address|`8`|ACK|EOT
Bit 0 1 = Enable print mode
Bit 1 1 = Direction forward
Bit 2 1 = External Product Detect
Bit 3 1 = External Encoder
Bit 4 Don't Care
Bit 5 Don't Care
Bit 6 1 = Print image inverted
Bit 7 Don't Care

'&' 0x26 Line Speed (RANGE 10-200)

Q. ESC|STX|Address|`&`|SOH|EOT
R. ESC|STX|Address|`&`|`xy`|EOT

D. ESC|STX|Address|`&`|`xy`|EOT
X. ESC|STX|Address|`&`|ACK|EOT

'd' 0x64 Encoder Divider (Range 0-7)

Q. ESC|STX|Address|`d`|SOH|EOT
R. ESC|STX|Address|`d`|`ab`|EOT

D. ESC|STX|Address|`d`|`ab`|EOT
X. ESC|STX|Address|`d`|ACK|EOT

"' 0x27 Product Delay (RANGE 1-255)

Q. ESC|STX|Address|`0x27`|SOH|EOT
R. ESC|STX|Address|`0x27`|`xy`|EOT

D. ESC|STX|Address|`0x27`|`xy'|EOT
X. ESC|STX|Address|`0x27`|ACK|EOT

')' 0x29 Inter-Character spaces (RANGE 1-25)

Q. ESC|STX|Address|`)`|SOH|EOT
R. ESC|STX|Address|`)`|`xy`|EOT

D. ESC|STX|Address|`)`|`xy'|EOT
X. ESC|STX|Address|`)`|ACK|EOT

‘j’ Reset Print Head (Write only)

D. ESC|STX|Address|`j`| 96 |CR|EOT
X. ESC|STX|Address|`j`|ACK|EOT

‘G’ 0x47 Errors

Q. ESC|STX|Address|`G`|SOH||EOT
R. ESC|STX|Address|`G`|'xy'|EOT

Where:

Byte x Bits 3,2,1,0
Bit 3 = UART Overrun Error
Bit 2 = Communication Overrun Error
Bit 1 = UART Framing Error
Bit 0 = UART Parity Error

Where:

Byte y Bits 3,2,1,0
Bit 3 = Font checksum error loading from card to chip
Bit 2 = Font 1 checksum error in Ram
Bit 1 = Font 0 checksum error in Ram
Bit 0 = Real Time Clock Memory error

D. ESC|STX|Address|`G`|'xy'|EOT

same bit positions as above
use only as a mask to clear error bits.
i.e. X = 0001 and y = 0100 clears real time clock memory error and communications overrun error.

X. ESC|STX|Address|`G`|ACK|EOT

SPECIAL FIELD OBJECTS

Message Objects define special characteristics about the messages contained in line 1 or line 2. These may define for example font size, sequence number, date code, etc. There may be up to 15 Objects (special fields) for each line in a message with the limitation that there can only be 1 sequence number imbedded in a message.

'P' 0x50 Message Objects

Q. ESC|STX|Address|`P`|SOH|aabbEOT

R. ESC|STX|Address|`P`|'aabbccddeeffgggghhhh' |EOT

Where: aa = objects for which line 0 or 1

bb = number of objects transmitted. (Max 15)

Each object as defined by bb: (repeat the following for each object)

cc = Position within message string

dd = Number of characters in object

ee = Attribute of the object

Where: ee= 00 Normal Alpha/Numeric character

ee= 01 Time Hours

ee= 02 Time Minutes

ee= 03 Time Seconds

ee= 04 Date Month

ee= 05 Date Day

ee= 06 Date Year

ee= 07 Date Julian

ee= 08 Sequence Number (only 1 per message)

ee= 09 Barcode

ee= 0A Shift Code

ee= 0B Expiration Date Month

ee= 0C Alpha Date Code

ee= 0D Expiration Date Year

ee= 0E Expiration Date Julian

ee= 0F Expiration Date Day

ff = font of object

Where: ff= 00 for 2 Line Font

ff= 01 for 1 Line Font

gggg = starting column of object in printed image (reserved

hhhh = starting row of object in printed image

D. ESC|STX|Address|`P`|'aabbccddeeffgggghhhh' |EOT

X. ESC|STX|Address|`P`|ACK|EOT

'$' 0x24 Line 1 Message (max 24 characters)

Q. ESC|STX|Address|`$`|SOH|EOT
R. ESC|STX|Address|`$`|`message`|CR|EOT

D. ESC|STX|Address|`$`|`message`|CR|EOT
X. ESC|STX|Address|`$`|ACK|EOT

'%' 0x25 Line 2 Message (max 24 characters)

Q. ESC|STX|Address|`%`|SOH|EOT
R. ESC|STX|Address|`%`|`message`|CR|EOT

D. ESC|STX|Address|`%`|`message`|CR|EOT
X. ESC|STX|Address|`%`|ACK|EOT

':' 0x3A Logo1 Name (read only - max 9 characters)

Q. ESC|STX|Address|`:`|SOH|`xy`|EOT
R. ESC|STX|Address|`:`|`logo name`|CR|EOT
Where: x = don't care
y = Bit 0 = 0 = Logo Name in Font 0
1 = Logo Name in Font 1
Bit 1 = 0 = Get Name from on board data flash chip
1 = Get Name fro Data Flash card

';' 0x3B Logo2 Name (read only - max 9 characters)

Q. ESC|STX|Address|`;`|SOH|xy|EOT
R. ESC|STX|Address|`;`|` logo name `|CR|EOT
Where: x = don't care
y = Bit 0 = 0 = Logo Name in Font 0
1 = Logo Name in Font 1
Bit 1 = 0 = Get Name from on board data flash chip
1 = Get Name fro Data Flash card

'<' 0x3C Logo3 Name (read only - max 9 characters)

Q. ESC|STX|Address|`<`|SOH|`xy`|EOT
R. ESC|STX|Address|`<`|` logo name `|CR|EOT
Where: x = don't care
y = Bit 0 = 0 = Logo Name in Font 0
1 = Logo Name in Font 1
Bit 1 = 0 = Get Name from on board data flash chip
1 = Get Name fro Data Flash card

'G' 0x47 Error Flags (read only)

Q. ESC|STX|Address|`G`|SOH|EOT
R. ESC|STX|Address|`G`|`xy'|EOT

Where Byte x Bits 3,2,1,0

Bit 3 = Not Used
Bit 2 = Font Load error
Bit 1 = Uart Parity Error
Bit 0 = clock chip memory read/write error

Where Byte y Bits 3,2,1,0

Bit 3 = Not Used
Bit 2 = Not Used
Bit 1 = Not Used
Bit 0 = Not Used

'R' 0x52 Head Status (read only)

Q. ESC|STX|Address|`R`|SOH|EOT
R. ESC|STX|Address|`R`|`xy'|EOT

Where: Byte x Bits 3,2,1,0

Bit 3 = Not Used
Bit 2 = Latched eye active
Bit 1 = Unfiltered eye active
Bit 0 = Product being printed

Where: Byte y Bits 3,2,1,0

Bit 3 = auto repeat print gap active
Bit 2 = Not Used
Bit 1 = Input buffer Line 2 full
Bit 0 = Input buffer Line 1 full

'Q' 0x51 Starting Sequence Number (max. 9 digits) – OP2/3

Q. ESC|STX|Address|`Q`|SOH|EOT
R. ESC|STX|Address|`Q`|`zzzzzzzzz'| CR | EOT

Where: zzzzzzzzz = starting sequence number.

D. ESC|STX|Address|`Q `|`zzzzzzzzz'| CR | EOT
X. ESC|STX|Address|`Q`|ACK|EOT

'3' 0X31 Days until Expiration (max 999) – OP3

Q. ESC|STX|Address|`3`|SOH|EOT
R. ESC|STX|Address|`3`|`aaaa`|EOT

Where: aaaa = number of days until expiration in BCD format

D. ESC|STX|Address|`3`|aaaa`|EOT

Where: aaaa = number of days until expiration in BCD format

X. ESC|STX|Address|`3`|ACK|EOT

‘0’ 0x30 Shift Code – OP3

Q. ESC|STX|Address|`0`|SOH||EOT
R. ESC|STX|Address|`0`|`xxyyzz`|CR|EOT
Where: xx = shift start hours
yy = shift start minutes
zz = shift code to print

D. ESC|STX|Address|`0`|`xxyyzz`|CR|EOT
Where: xx = shift start hours
yy = shift start minutes
zz = shift code to print
X. ESC|STX|Address|`0`|ACK|EOT

'2' 0x32 Date and Time Setting / Reading – OP2/3

Q. ESC|STX|Address|`2`|SOH|EOT
R. ESC|STX|Address|`2`|`aabbccddeeffgg'| EOT
Where: aa= Time of Day Seconds (not used)
bb= Time of Day Minutes
cc= Time of Day Hours
dd= Date Day of Week (not used)
ee= Date Day
ff = Date Month
gg= Date Year

D. ESC|STX|Address|`2`|`aabbccddeeffgg'| CR | EOT
X. ESC|STX|Address|`2`|ACK|EOT

'u' 0x75 Store message into non-volatile memory

D. ESC|STX|Address|`u`| EOT
X. ESC|STX|Address|`u`|ACK|EOT

‘/’ 0x2f Product Counter (6 Digits Max) – OP3

Q. ESC|STX|Address|`/`|SOH|EOT
R. ESC|STX|Address|`/`|`wwxxyyzzcccccc`|CR|EOT
Where: ww = Product counter start hours
xx = Product counter start minutes
yy = Product counter stop hours
zz = Product counter stop minutes
cccccc = counter (6 Digits Max)

D. ESC|STX|Address|`/`|`wwxxyyzzcccccc`|CR|EOT
Where: ww = Product counter start hours
xx = Product counter start minutes
yy = Product counter stop hours
zz = Product counter stop minutes
cccccc = counter
X. ESC|STX|Address|`/`|ACK|EOT

PART 7: OPTION JUMPERS AND CABLING

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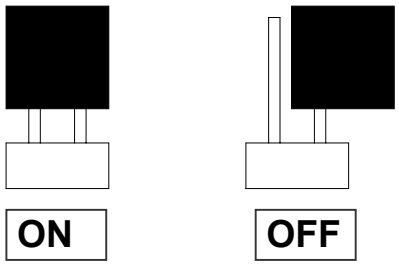
OPTION JUMPER DESCRIPTIONS

Factory default for all jumper settings is in the ON position. To remove a jumper in the OFF position place the jumper on a single pin for future use



VSEL J7

This jumper when in the ON position supplies a +12vdc source on the RJ50 input connector. The hand held controller uses this source for power. Removing this jumper prevents the +12vdc source from exiting on pin 2 and possibly damaging other external control devices.

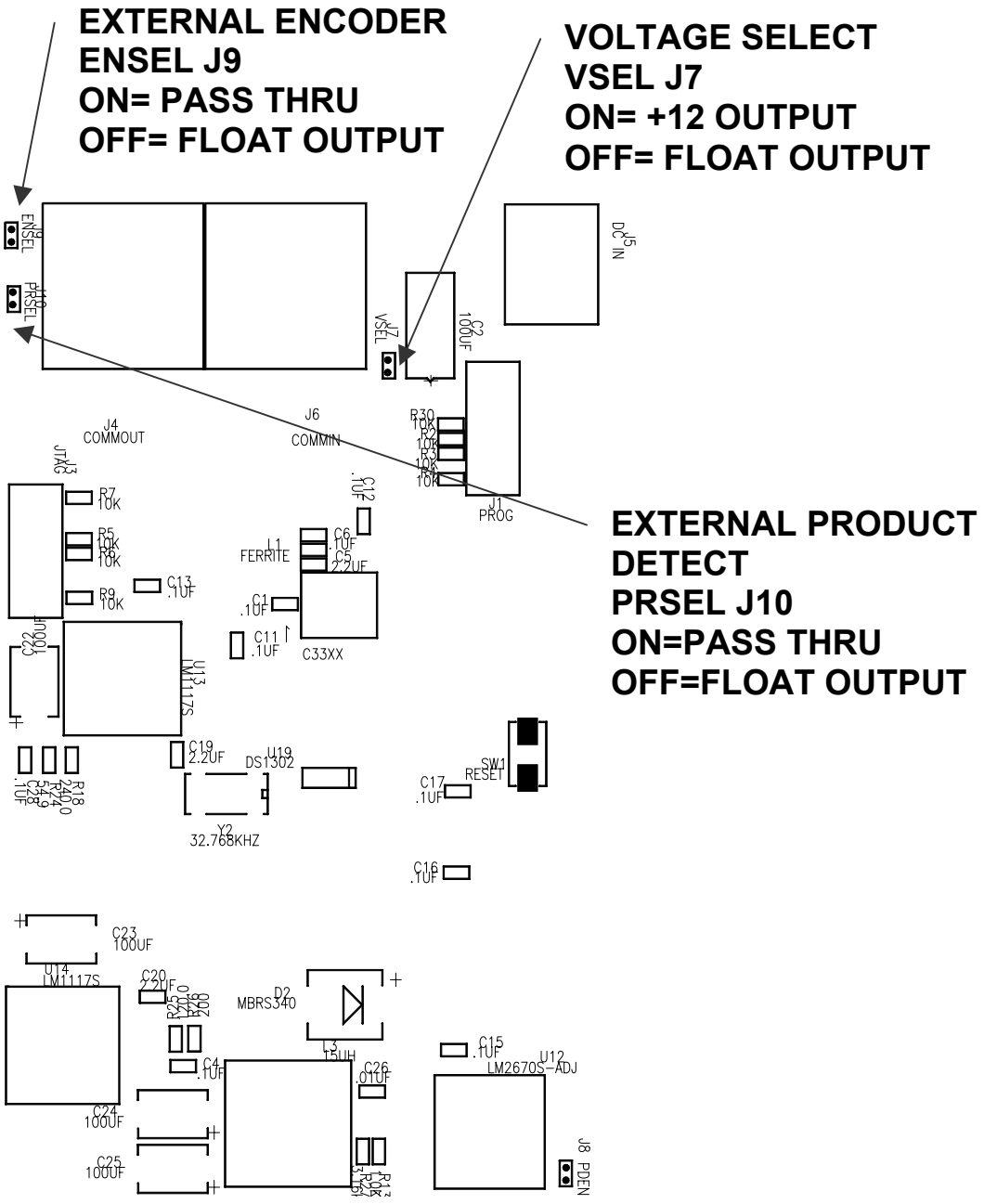
ENSEL J9

When this jumper is in the ON position the external encoder signal connected to the RJ50 output connector is passed through the print carriage to the RJ50 input connector. This allows the same encoder signal to drive several print carriages. If this is not desired remove the jumper

PRSEL J10

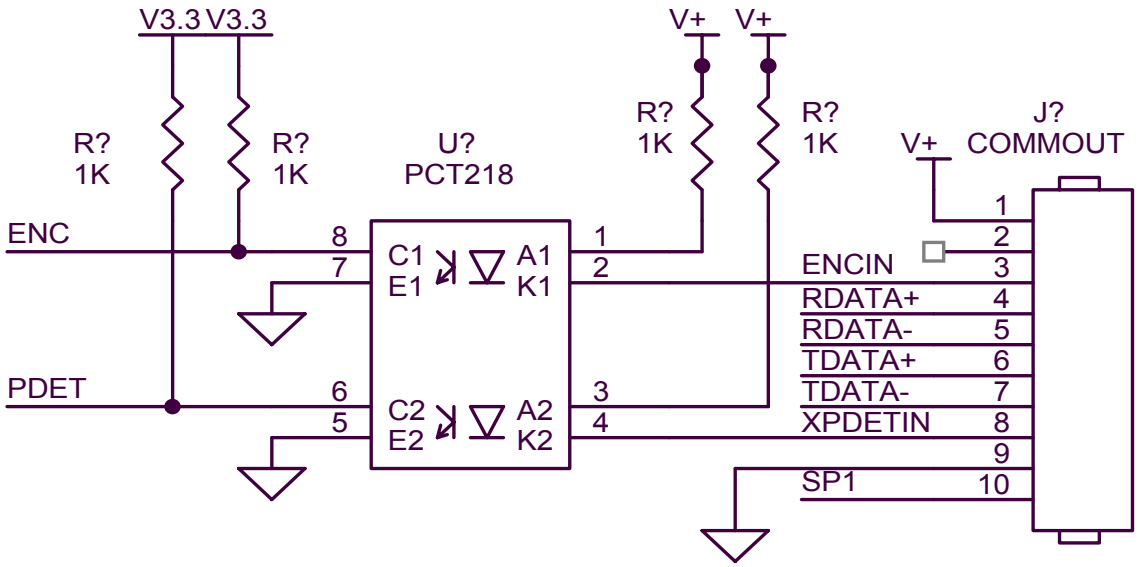
When this jumper is in the ON position the external product detect signal connected to the RJ50 output connector is passed through the print carriage to the RJ50 input connector. This allows the same product detect signal to drive several print carriages. If this is not desired remove the jumper

JUMPER LOCATION



OPTION CABLING DESCRIPTIONS

Evolution printers can accept inputs from external sources to control product detection and timing circuits to track product speed (Encoders). These device inputs are internally connected to pull-up resistors and drive optically isolated devices and may be driven by open collector or switch contacts.



Each input requires the capability of sinking 12ma to ground as depicted in the above circuit. Connection to the optional control port requires an RJ50 connector.

Below is an example of the external product detect eye supplied by DIGITAL DESIGN INC part number C21006.

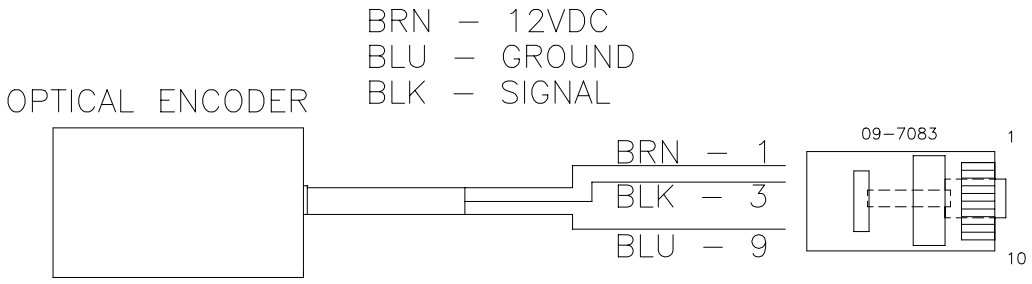
For those applications requiring accurate line speed detection an external encoder is needed.

The external encoder will provide accurate signals eliminating problems in those applications where moving product has an acceleration or deceleration component in its motion, and is often mandatory when trying to produce a reliable printed barcode. Selecting the external encoder should take into consideration a supply source that will yield the correct aspect ration of printed height to width.

A vertical printed column contains 150 dots and spans 1/2". This equates to 0.00333 between each vertical dot placement, thusly each horizontal dot placement should be the same to maintain a perfect 300DPI ratio.

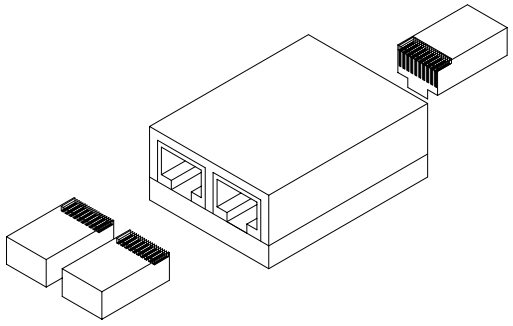
Selecting the external encoder, the line speed calculation is replaced by a scalable encoder setting ranging from 0-7 allowing a printed message to be compressed or expanded. Ideally, the external encoder should be provided to use this feature to its maximum advantage.

If the external encoder were selected to provide a resolution of 0.00333 then the external encoder set to 0 would produce the correct aspect ratio and the message can only be expanded in multiples of 0.00333 thousands of an inch. This may provide all that is required. Selecting an external encoder source that provided 0.00111 thousands of an inch would be a better choice.



The above pictorial is an example of the connections for an external encoder.

If it becomes necessary to supply both external product detect, and external encoder, both signals can be wired into the same connector, or DIGITAL DESIGN INC can supply an optional adaptor to allow connection of both cables (part number C21012)



PART 8: SPECIFICATIONS

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PRINTER SPECIFICATIONS

PRINT CHARACTERISTICS

Character Set:	Full alphanumeric and 20 special symbols
Standard Font:	Arial style
Logos:	up to 3 resident
Line Speeds:	From 10 to 200 fpm
Encoder Ratio:	0 to 7
Print Delay:	From 1 to 255 (approx .060 in to 15.0 in)
Character Heights:	
	1/2” single line of print
	7/32” two lines of print
Length:	24 characters (1/2”) 48 characters (7/32”)
Message Storage	50 Messages
Print Head to Product Distance:	Up to 1/4" (6.35 mm)

CONTROLLER

Standard Finish:	Hi Impact ABS Black
Dimensions:	8.75"H x 4.25"W x 2.7"D (222 mm x 108 mm x 69 mm)
Weight:	1 lbs. (4.5 kg)
Control Panel:	Touch Switches and 4x16 Line LCD

PRINT CARRIAGE

Standard Finish:	Aluminum Black Anodized
Dimensions:	3.0"H x 1.8"W x 4.0"D (76 mm x 46 mm x 102 mm)
Weight:	1 lbs. (4.5 kg)

ENVIRONMENTAL CONDITIONS

Temperature Range:	40°F - 104°F (5°C - 40°C)
Humidity:	up to 90% relative, non-condensing
Electrical Supply:	100-250 VAC; 50-60 Hz; 0.25Amp

GENERAL

Product Detector:	IR LED convergent
Communications link	RS485 (115KBAUD 7-BITS EVEN PARITY 1 STOP BIT)

DEFAULT SETTINGS

FUNCTION	DEFAULT SETTING	RANGE
DIRECTION	<	< >
FONTS	ARIEL STYLE	USER DEFINED
INTER-CHARACTER SPACING	10	1 - 25
LANGUAGE	ENGLISH	ENGLISH / SPANISH
LINE SPEED	100	10 - 200
LOGOS	0	1 - 3
PRINT INVERSE	NORMAL	NORMAL / INVERSE
PRODUCT DETECT	INTERNAL	INTERNAL / EXTERNAL
EXTERNAL ENCODER	INTERNAL	INTERNAL / EXTERNAL
PRINT DELAY	1	1 - 255
ENCODER RATIO	4	0 - 7
MESSAGE STORAGE (OPTION PACK 1, 1.5, 2, 3)	1	1 - 50
PASSWORD (OPTION PACK 1, 1.5, 2, 3)	12345	5 CHARACTERS USER DEFINED
AUTO REPEAT (OPTION PACK 1, 2)	0	0 - 255
DATE (OPTION PACK 2, 3)	dd/dm/dy	User defined
TIME (OPTION PACK 2, 3)	hh:mm	User defined
SHIFT CODE (OPTION PACK 3)	TIMES AND CODES SET TO ZERO	User defined
DATE OFFSET (OPTION PACK 3)	OFFSET DAYS SET TO ZERO	User defined
PRODUCT COUNTER (OPTION PACK 3)	TIMES AND CODES SET TO ZERO	User defined

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED): 4500 Black

SYNONYM/CHEMICAL CLASS: Solution of dyes

PRODUCT USE: Ink Jet Printing Ink

MANUFACTURER'S NAME: Digital Design Inc.
ADDRESS: 67 Sand Park Road
Cedar Grove, NJ 07009

MANUFACTURER'S PHONE: 973-857-9500
EMERGENCY PHONE: 1-800-255-3925 (Chem-Tel Inc.)

DATE OF PREPARATION: November 17, 2005

HMIS Codes	
HEALTH (BLUE)	1
FLAMMABILITY (RED)	0
REACTIVITY (YELLOW)	0

2. COMPOSITION, INFORMATION ON HAZARDOUS INGREDIENTS

CHEMICAL FAMILY	CAS #	% w/w	EXPOSURE LIMITS IN AIR (ppm)					
			ACGIH		OSHA			OTHER
			TLV	STEL	PEL	STEL	IDLH	
Lactam	872-50-4	< 3	N/L	N/L	N/L	N/L	N/L	100

N/L = Not Listed

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This material presents mild health hazards when used in the prescribed manner.

POTENTIAL HEALTH EFFECTS FROM ACUTE AND CHRONIC EXPOSURE

Inhalation: This product produces a low odor and should not cause any respiratory problems when used in the prescribed manner.

Contact with Skin or Eyes: Due to the colorant components, skin contact will cause discoloration of the skin and may be removed by washing. Contact may also cause slight irritation of the skin. Contact with the eyes will cause irritation and may impair vision by staining the eye.

Ingestion: Ingestion of this material may stain the mouth and esophagus and may cause irritation of the upper gastrointestinal tract, which can cause difficulty in swallowing. Minute amounts aspirated into the lungs during ingestion or vomiting may cause pulmonary injury.

PART II *WHAT DO I DO IF A HAZARDOUS SITUATION OCCURS?*

4. FIRST-AID MEASURES

Inhalation: Remove victim to fresh air, and get medical aid immediately. If breathing has ceased, apply artificial respiration with oxygen and a suitable mechanical device such as a bag and a mask. Do NOT use mouth-to-mouth resuscitation.

Eyes: Flush eyes with plenty of water for at least 15 minutes. Get medical aid as a precautionary measure. Do NOT allow victim to rub or keep eyes closed.

Skin: If spilled on skin or eyes, immediately wash it off with running water. Remove contaminated clothing, taking care not to contaminate the eyes. Victims must seek immediate medical attention if any symptoms of irritation develop

Ingestion: If chemical is swallowed, seek medical attention. If professional advice is not available and victim is conscious and alert, give two to four cups of milk or water. Do not induce vomiting.

Victims of chemical exposure should be taken for medical attention if symptoms of exposure develop. Take copy of label and MSDS to physician or health professional with victim.

5. FIRE-FIGHTING MEASURES

FLASHPOINT C (method): > 100 ^{o}C (Seta flash, closed-cup)
AUTO-IGNITION TEMPERATURE: >200 ^{o}C
EXPLOSIVE LIMITS (in air by volume %): Lower: 0.5
Upper: 8

FIRE EXTINGUISHER MATERIALS AND METHODS: Take precautionary action against electrostatic discharge. Vapors may be ignited by pilot lights, other flames, sparks, heaters, smoking, electric motors, static discharge, other ignition sources at locations distant from material handling point. Product can accumulate static charges, which can cause an incendiary electrical discharge.

Carbon Dioxide: OK Water Spray: OK
Alcohol Foam: OK Dry Chemical: OK

SPECIAL FIRE FIGHTING PROCEDURES: wear a self-contained breathing apparatus with a full face piece operated in the positive pressure demand mode with appropriate

turn-out gear and chemical resistant personal protective equipment. Refer to the personal protective equipment section of this MSDS.

UNUSUAL FIRE AND EXPLOSION HAZARDS: When subjected to prolonged high temperatures or burning, this product will emit fumes containing carbon monoxide, nitrogen oxides and carbon dioxide. Closed containers may rupture (due to build up of pressure) when exposed to extreme heat.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: For incidental spills, use professional equipment such as rubber gloves and rubber apron, splash goggles or safety glasses. Trained personnel that use pre-planned procedures should respond to uncontrolled or large releases. Proper protective equipment should be used. In case of any spill, clear the affected area, protect people, and respond with trained personnel. Respiratory protection should be used to protect against potentially irritating contaminated dust.
Absorb spilled liquid with polypads or other appropriate materials. Avoid splashing or spraying liquid. Clean area thoroughly by rinsing with water. It may not be possible to decolorize stains. Place all spill residues in a double plastic bag, in appropriate sealed container. Dispose of in accordance with Federal, State, and local waste disposal regulations.

PART III *How can I prevent hazardous situations form occurring?*

7. HANDLING AND STORAGE

WORK PRACTICES AND HYGENE PRACTICES: Avoid getting chemicals ON YOU or IN YOU. Wash hands after handling chemicals. Do not eat or drink while handling chemicals. Avoid breathing mists of this ink.

STORAGE AND HANDLING PRACTICES: Store product in properly labeled, closed, containers in cool location. Avoid oxidizing and reducing agents and alkalies.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accident Release Measures). Make certain application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Clean equipment with appropriate flushing solution before maintenance begins. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

8. EXPOSURE CONTROLS – PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Use a mechanical fan or vent area to outside.

RESPIRATORY PROTECTION: None required under routine conditions of use. It is advisable to use respiratory protection during the release response procedures.

EYE PROTECTION: Splash goggles or safety glasses.

HAND PROTECTION: Use of butyl gloves is recommended. Check gloves for leaks. Wash hands after removing gloves.

BODY PROTECTION: Use body protection appropriate for task. Cover-alls, rubber aprons, or chemical protective clothing made from natural rubber are generally acceptable, depending upon the task.

9. MATERIAL CHARACTERISTICS

PHYSICAL STATE:	Liquid	% VOLITILE (by weight):	< 90 %
SPECIFIC GRAVITY:	0.90 – 1.1	MELTING POINT:	-30 to -10 °C
WATER SOLUBILITY:	Miscible	BOILING POINT:	> 90 °C

APPEARANCE, ODOR AND COLOR: This ink is a black liquid and has a mild odor.

10. STABILITY AND REACTIVITY

STABILITY: Stable

CONDITIONS TO AVOID: Extreme heat may cause material to decompose, producing acrid smoke and hazardous byproducts of carbon monoxide, nitrogen oxides and carbon dioxide.

HAZARDOUS POLYMERIZATION: Will not occur.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

CARCINOGENITY: This product's ingredients are not found on the following lists: FEDERAL OSHA 2 LIST, NTP, IARC, CAL/OSHA.

IRRITANCY OF PRODUCT: Listed below are the potential reproductive effects which may occur after exposure to this product.

Mutagenicity: While no data exist for the product, this ink is not expected to cause any fetal toxicity problems related to mutagenicity.

Teratogenicity: While no data exist for this product, this ink is not expected to cause any fetal toxicity problems related to teratogenicity.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: There are no known chemical conditions, which would be aggravated by exposure to this product.

TOXICOLOGICALLY SYNERGISTIC PRODUCTS: None known.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms. No specific medical procedures are available.

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12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: Currently, there are no adverse environmental effects, which have been reported for this ink, except discoloration. All work practice should be aimed at eliminating environmental contamination.

EFFECT OF MATERIAL ON PLANTS OR ANIMALS: Animal studies on components of this ink indicate that it is a mild skin and eye irritant and moderately toxic by ingestion. No detailed studies have been performed for environmental effects.

EFFECT OF CHEMICAL ON AQUATIC LIFE: There are no reported adverse effects on aquatic life due to exposure to this ink. It is expected that this material will float near the surface of water and dissipate in a time-frame dependent upon the magnitude of the release and the movement of the water.

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13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This chemical, if unaltered by handling, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority. Discharge into a sanitary sewer or storm drain may violate local ordinance.

EPA WASTE NUMBER: Not Applicable.

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14. REGULATORY INFORMATION

TSCA INVENTORY STATUS: The chemicals in this compound ARE listed on the TSCA Inventory.

SARA Title III – Section 313, Emissions Reporting: N-methyl-2-pyrrolidone (CAS 872-50-4)

MARINE POLLUTANT: This product contains no chemicals which have been designated by the Department of Transportation to be Marine Pollutants in 49 CFR 172.101, Appendix B.

CALIFORNIA PROPOSITION 65: Proposition 65 requires manufacturers or distributors of consumer products into the State of California to provide a warning statement if the product contains ingredients for which the state has found to cause cancer, birth defects, or other reproductive harm. This ink contains N-methyl-2-pyrolidone (CAS 872-50-4)

CERCLA REPORTABLE QUANTITIES (RO): Not Applicable.

15. OTHER INFORMATION

PREPARED BY: Digital Design Inc.
67 Sand Park Road
Cedar Grove, NJ 07009

The information contained herein is furnished without warranty of any kind. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all other sources to assure proper use and disposal of these materials and the safety and health of employees and customers and the protection of the environment.

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

PART I *What is the material and what do I need to know in an emergency?*

6. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED):	COLOR INKS
SYNONYM/CHEMICAL CLASS:	Solution of Dyes
PRODUCT USE:	Ink Jet Printing Ink
MANUFACTURER'S NAME:	Digital Design Inc.
ADDRESS:	67 Sand Park Road Cedar Grove, NJ 07009
MANUFACTURER'S PHONE:	973-857-9500
EMERGENCY PHONE:	1-800-255-3924 (Chem-Tel Inc)
DATE OF PREPARATION:	November 17, 2005

Hazardous	
	1
	0
REACTIVITY (YELLOW)	0

7. COMPOSITION, INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH			OSHA		OTHER
			TLV	STEL	PEL	STEL	IDLH	
			mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	
Polyazo Dyestuff	Proprietary	< 5.0	NE	NE	NE	NE	NE	NE
Solubilized Sulfer Dye	1326-86-9	< 2.5	NE	NE	NE	NE	NE	NE
Disazo Dyestuff	Proprietary	< 3.3	NE	NE	NE	NE	NE	NE

NE = Not Established

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			OTHER
			TLV	STEL	PEL	STEL	IDLH	
			mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	
pH Modifier	Proprietary	< 2.0	NE	NE	NE	NE	NE	NE
5-Chloro-2-methyl-4-isothiazoline-3-one	26172-55-4	< 0.1	NE	NE	NE	NE	NE	NE
WATER	7732-18-5	> 50	NE	NE	NE	NE	NE	NE
Glycol	Proprietary	<20	NE	NE	NE	NE	NE	NE

8. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This is a **colored** liquid with properties similar to water. It is a low hazard material which presents only slight health hazards. Though the material is not flammable, the byproducts of thermal decomposition may include toxic gas (i.e. carbon monoxide and nitrogen oxides).

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: This material is generally low risk, when used in the prescribed manner. Health affects expected may include irritation of the affected part of the body.

Inhalation: The constituents of this material are of low volatility, low order of acute toxicity, and will not normally cause inhalation problems. Inhalation of a mist of this material may cause respiratory irritation, which shall be relieved upon termination of the exposure.

Contact with Skin or Eyes: Due to the colorant components, skin contact will cause discoloration of the skin and is not easily removed by washing. Irritation may occur. Contact with the eyes will cause burning and may impair vision by staining the eye.

Skin Absorption: The major components of this ink do not absorb through the skin. While trace components have been reported to absorb, their concentration in this ink is sufficiently low so that this is not considered a problem.

Ingestion: Ingestion of this material will stain the mouth and esophagus. Ingestion of large amounts will cause gastrointestinal distress. Ingestion will cause irritation of the upper gastrointestinal tract, causing difficulty in swallowing.

HEALTH EFFECTS OR RISKS FROM EXPOSURE (An explanation in lay terms).

ACUTE: This ink is generally a low hazard material. The major acute affect is discoloration of affected tissue and local irritation. Contact with the eyes will cause irritation and may impair vision.

CHRONIC: No chronic affects are expected from any of the constituents of this ink at the concentrations present in the ink.

PART II *WHAT DO I DO IF A HAZARDOUS SITUATION OCCURS?*

9. FIRST-AID MEASURES

If spilled on skin or eyes, immediately wash it off with running water. Remove contaminated clothing, taking care not to

contaminate the eyes. Victims must seek immediate medical attention if any symptoms of irritation develop. If the product is in the eyes, flush under gentle running water for 15 minutes. If chemical is inhaled and causes irritation, remove victim to fresh air.

If chemical is swallowed, seek medical attention. If professional advice is not available, give large quantities of water and induce vomiting if victim is conscious. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow.

If excessively inhaled, remove to fresh air. If difficulty in breathing, give artificial respiration.

Victims of chemical exposure should be taken for medical attention if symptoms of exposure develop. Take copy of label and MSDS to physician or health professional with victim.

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10. FIRE-FIGHTING MEASURES

FLASHPOINT C (method): >305 deg F TCC
IGNITION TEMPERATURE C: Not applicable
FLAMMABLE LIMITS (in air by volume %): Lower: Not Applicable
Upper: Not Applicable

FIRE EXTINGUISHER MATERIALS AND METHODS: Fire fighting should concentrate on surrounding materials. This material will not contribute to the intensity of the fire or the toxicity of the smoke.

Water Spray: OK Carbon Dioxide: OK
Foam: OK Dry Chemical: OK Halon: OK

SPECIAL FIRE FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural fire fighters must wear self-contained breathing apparatus and full protective equipment. This ink may discolor run-off water.

UNUSUAL FIRE AND EXPLOSION HAZARDS: When subjected to prolonged high temperatures or burning, this product will emit fumes containing carbon monoxide, nitrogen oxides and carbon dioxide.

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Not sensitive.

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9. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: For incidental spills, use professional equipment such as rubber gloves and rubber apron, splash goggles or safety glasses. Uncontrolled or large releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of any spill, clear the affected area, protect people, and respond with trained personnel. Respiratory protection should be used to protect against potentially irritating contaminated dust.

Absorb spilled liquid with polypads or other appropriate materials. Avoid splashing or spraying liquid. Decontaminate area thoroughly by rinsing with water. It may not be possible to decolorize stains. Place all spill residue in a double plastic bag, in appropriate sealed container. Dispose of in accordance with Federal, State, and local waste disposal regulations.

PART III *How can I prevent hazardous situations form occurring?*

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10. HANDLING AND STORAGE

WORK PRACTICES AND HYGENE PRACTICES: Avoid getting chemicals ON YOU or IN YOU. Wash hands after handling chemicals. Do not eat or drink while handling chemicals. Avoid breathing mists of this ink.

STORAGE AND HANDLING PRACTICES: Store product in properly labeled, closed, containers in cool location.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accident Release Measures). Make certain application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Decontaminate equipment using soapy water before maintenance begins. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

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11. EXPOSURE CONTROLS – PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Use a mechanical fan or vent area to outside.

RESPIRATORY PROTECTION: None required under routine conditions of use and proper ventilation. It is advisable to use respiratory protection (NIOSH-Approved) during prolonged exposure.

EYE PROTECTION: Splash goggles or safety glasses.

HAND PROTECTION: Use lightweight rubber or plastic gloves. Check gloves for leaks. Wash hands after removing gloves.

BODY PROTECTION: Use body protection appropriate for task. Cover-alls, rubber aprons, or chemical protective clothing to minimize exposure. Clothing made from natural rubber are generally acceptable, depending upon the task.

9. MATERIAL CHARACTERISTICS

PHYSICAL STATE:	Liquid	% VOLATILE :< 9.34 LB/GAL	
VAPOR DENSITY:	Not Available	EVAPORATION RATE:	Not Available
SPECIFIC GRAVITY:	1.0-1.1	MELTING POINT OR RANGE :	
	<15°C		
SOLUBILITY IN WATER:	Miscible	BOILING POINT:	>100°C
VAPOR PRESSURE:	Not Available	pH:	9.0 – 10.5
ODOR THRESHOLD:	Not Established	OIL/WATER DISTRIB. COEFFICENT: NA	

APPEARANCE, ODOR AND COLOR: This ink is a **colored** liquid, having a slight odor.
HOW TO DETECT THIS SUBSTANCE (warning properties): This ink will be readily visible by its color.

10. STABILITY AND REACTIVITY

STABILITY: Stable
CONDITIONS TO AVOID: Extreme heat may cause material to decompose, producing acrid smoke and hazardous byproducts of carbon monoxide, nitrogen oxides and carbon dioxide. This ink is compatible with most chemicals found in the work place. Avoid strong oxidizing agents.
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: This material is compatible with chemicals generally found in the industrial work place. The product would not be compatible with water reactive materials.
HAZARDOUS POLYMERIZATION: Will not occur.

HAZARDOUS DECOMPOSITION PRODUCTS: Components may form carbon monoxide during combustion.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

SUSPECTED CANCER AGENT: This product's ingredients are not found on the following lists: FEDERAL OSHA 2 LIST, NTP, IARC, CAL/OSHA.

IRRITANCY OF PRODUCT: Listed below are the potential reproductive effects which may occur after exposure to this product.

Mutagenicity: While no data exist for the product, this ink is not expected to cause any fetal toxicity problems related to mutagenicity.
Teratogenicity: While no data exist for this product, this ink is not expected to cause any fetal toxicity problems related to teratogenicity.
Reproductive Toxicity: While no data exist for the product, this ink is not expected to have an adverse effect on the male or female reproductive system or to cause any fetal toxicity problems.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: There are no known chemical conditions which would be aggravated by exposure to this product.

Dermal Exposure: Discolors skin and may cause local irritation.
Acute Dermal LD50 None
Ingestion Exposure: May cause gastrointestinal distress.
Acute Oral LD50 >15 G/KG - Rat
Inhalation Exposure: Not likely to occur, but may cause irritation.
Acute Inhalation LC50 None

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms. No specific medical procedures are available.

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13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This chemical, if unaltered by handling, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority. Discharge into a sanitary sewer or storm drain may violate local ordinance for color or solids.

EPA WASTE NUMBER: Not Applicable. This material is not a RCRA Hazardous Waste for disposal purposes.

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14. TRANSPORTATION INFORMATION

THIS MATERIAL IS NOT HAZARDOUS BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: This ink is not regulated by the U.S. Department of Transportation.
HAZARD CLASS NUMBER AND DESCRIPTION: Not Applicable.
UN IDENTIFICATION NUMBER: Not Applicable.
DOT LABELS REQUIRED: Not Applicable.
PACKAGING GROUP: Not Applicable.
EMERGENCY RESPONSE GUIDE NUMBER: Not Applicable.
CTC DANGEROUS GOODS CHIPPING REGULATIONS: THIS MATERIAL IS NOT CONSIDERED A DANGEROUS GOOD.

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15. REGULATORY INFORMATION

SARA REPORTING REQUIREMENTS: No component in this product is subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act.
TSCA INVENTORY STATUS: The chemicals in this compound ARE listed on the TSCA Inventory.
MARINE POLLUTANT: This product contains no chemicals which have been designated by the Department of Transportation to be Marine Pollutants in 49 CFR 172.101, Appendix B.
CALIFORNIA PROPOSITION 65: No component of this solution is on the California Proposition 65 lists.
CERCLA REPORTABLE QUANTITIES (RO): Not Applicable.
STATE REGULATORY INFORMATION: The following chemicals in this product are covered under specific State regulations:

Alaska – Designated Toxic and Hazardous Substance: None.
Pennsylvania – Hazardous Substance List: None.
Substances: None
California – Permissible Exposure Limits: None.

Rhode Island – Hazardous Substance List: None.
Illinois – Toxic Substance List: None.

West Virginia – Hazardous Substance List: None.
North Dakota – List of Hazardous Chemicals Reportable Quantities: None
Wisconsin – Toxic and Hazardous Substances: None.

Massachusetts – Substance List: None.
Minnesota – List of Hazardous

Missouri – Employer Information/Toxic Substance List: None.
Florida – Substance List: None
New Jersey – Right to Know Hazardous Substance List: None.
Kansas – Section 302/313 List: None.

LABELING (Precautionary Statements): CAUTION! This material may cause skin and eye irritation. Avoid getting the ink on your skin or in your eyes. In case of exposure, wash thoroughly with water. If irritation occurs, seek medical assistance. This material will not contribute to the intensity of a fire. The product may discolor runoff water. Store containers tightly closed in a cool location. Consult Material Safety Data Sheet.

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16. OTHER INFORMATION

PREPARED BY: Digital Design Inc.
67 Sand Park Drive
Cedar Grove, NJ 07009

The information contained herein is furnished without warranty of any kind. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all other sources to assure proper use and disposal of these materials and the safety and health of employees and customers and the protection of the environment.

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

PART I *What is the material and what do I need to know in an emergency?*

11. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED): 4600 Black

SYNONYM/CHEMICAL CLASS: Dispersion of pigments

PRODUCT USE: Ink Jet Printing Ink

MANUFACTURER'S NAME: Digital Design, Inc.
ADDRESS: 67 Sand Park Road
Cedar Grove, NJ 07009

BUSINESS PHONE: 1-973-857-9500
EMERGENCY PHONE: 1-800-255-3925 (Chem-Tel Inc.)
DATE OF PREPARATION: January 9, 2006

HMIS Codes	
HEALTH (BLUE)	1
FLAMMABILITY (RED)	0
REACTIVITY (YELLOW)	0

12. COMPOSITION, INFORMATION ON HAZARDOUS INGREDIENTS

CHEMICAL FAMILY	CAS #	% w/w	EXPOSURE LIMITS IN AIR (ppm)					
			ACGIH		OSHA			OTHER
			TLV	STEL	PEL	STEL	IDLH	
Alcohol	64-17-5	< 15	1000	N/L	1000	N/L	N/L	N/L

N/L = Not Listed

13. HAZARD IDENTIFICATION

This product is not a flammable liquid.

POTENTIAL HEALTH EFFECTS FROM ACUTE AND CHRONIC EXPOSURE

Inhalation: Inhalation of this material may cause respiratory irritation and can be prevented by wearing proper respiratory equipment. Vapor concentration should be limited to 300 ppm (daily TWA). Inhalation of higher concentrations may cause central nervous system depression – characterized by headache, nausea, and/or vertigo. Though single exposure to fumes may cause no harmful effects, repeated daily exposures may cause illness.

Contact with Skin or Eyes: Due to the colorant components, skin contact will cause discoloration of the skin and may be removed by washing. Contact may also cause slight irritation of the skin. Contact with the eyes will cause irritation and may impair vision by staining the eye.

Ingestion: Ingestion of this material may stain the mouth and esophagus and may cause irritation of the upper gastrointestinal tract, which can cause difficulty in swallowing. Ingestion may also result in similar effects to those caused by inhalation. Minute

amounts aspirated into the lungs during ingestion or vomiting may cause pulmonary injury.

PART II *WHAT DO I DO IF A HAZARDOUS SITUATION OCCURS?*

14. FIRST-AID MEASURES

Inhalation: Remove victim to fresh air, and get medical aid immediately. If breathing has ceased, apply artificial respiration with oxygen and a suitable mechanical device such as a bag and a mask. Do NOT use mouth-to-mouth resuscitation.

Eyes: Flush eyes with plenty of water for at least 15 minutes. Get medical aid as a precautionary measure. Do NOT allow victim to rub or keep eyes closed.

Skin: If spilled on skin or eyes, immediately wash it off with running water. Remove contaminated clothing, taking care not to contaminate the eyes. Victims must seek immediate medical attention if any symptoms of irritation develop

Ingestion: If chemical is swallowed, seek medical attention. If professional advice is not available and victim is conscious and alert, give two to four cups of milk or water. Do not induce vomiting.

Victims of chemical exposure should be taken for medical attention if symptoms of exposure develop. Take copy of label and MSDS to physician or health professional with victim.

15. FIRE-FIGHTING MEASURES

FLASHPOINT C (method): 89 ^{o}C (Seta flash, closed-cup)
AUTO-IGNITION TEMPERATURE: >200 ^{o}C
EXPLOSIVE LIMITS (in air by volume %): Lower: 0.5
Upper: 8

FIRE EXTINGUISHER MATERIALS AND METHODS: Take precautionary action against electrostatic discharge. Vapors may be ignited by pilot lights, other flames, sparks, heaters, smoking, electric motors, static discharge, other ignition sources at locations distant from material handling point. Product can accumulate static charges, which can cause an incendiary electrical discharge.
Carbon Dioxide: OK Water Spray: OK
Alcohol Foam: OK Dry Chemical: OK

SPECIAL FIRE FIGHTING PROCEDURES: wear a self-contained breathing apparatus with a full face piece operated in the positive pressure demand mode with appropriate turn-out gear and chemical resistant personal protective equipment. Refer to the personal protective equipment section of this MSDS.

UNUSUAL FIRE AND EXPLOSION HAZARDS: When subjected to prolonged high temperatures or burning, this product will emit fumes containing carbon monoxide, nitrogen oxides and carbon dioxide. Closed containers may rupture (due to build up of pressure) when exposed to extreme heat. This product's vapor is combustion sensitive to static discharge.

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12. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: For incidental spills, use professional equipment such as rubber gloves and rubber apron, splash goggles or safety glasses. Trained personnel that use pre-planned procedures should respond to uncontrolled or large releases. Proper protective equipment should be used. In case of any spill, clear the affected area, protect people, and respond with trained personnel. Respiratory protection should be used to protect against potentially irritating contaminated dust.
Absorb spilled liquid with polypads or other appropriate materials. Avoid splashing or spraying liquid. Clean area thoroughly by rinsing with water. It may not be possible to decolorize stains. Place all spill residues in a double plastic bag, in appropriate sealed container. Dispose of in accordance with Federal, State, and local waste disposal regulations.

PART III *How can I prevent hazardous situations form occurring?*

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13. HANDLING AND STORAGE

WORK PRACTICES AND HYGENE PRACTICES: Avoid getting chemicals ON YOU or IN YOU. Wash hands after handling chemicals. Do not eat or drink while handling chemicals. Avoid breathing mists of this ink.

STORAGE AND HANDLING PRACTICES: Store product in properly labeled, closed, containers in cool location. Avoid oxidizing and reducing agents and alkalies.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accident Release Measures). Make certain application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Clean equipment with appropriate flushing solution before maintenance begins. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

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14. EXPOSURE CONTROLS – PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Use a mechanical fan or vent area to outside.

RESPIRATORY PROTECTION: None required under routine conditions of use. It is advisable to use respiratory protection during the release response procedures.

EYE PROTECTION: Splash goggles or safety glasses.

HAND PROTECTION: Use of butyl gloves is recommended. Check gloves for leaks. Wash hands after removing gloves.

BODY PROTECTION: Use body protection appropriate for task. Cover-alls, rubber aprons, or chemical protective clothing made from natural rubber are generally acceptable, depending upon the task.

9. MATERIAL CHARACTERISTICS

PHYSICAL STATE:	Liquid	% VOLITILE (by weight):	< 90 %
SPECIFIC GRAVITY:	0.90 – 1.1	MELTING POINT:	-30 to -10 °C
WATER SOLUBILITY:	Miscible	BOILING POINT:	> 90 °C

APPEARANCE, ODOR AND COLOR: This ink is a black liquid and has a characteristic odor.

10. STABILITY AND REACTIVITY

STABILITY: Stable

CONDITIONS TO AVOID: Extreme heat may cause material to decompose, producing acrid smoke and hazardous byproducts of carbon monoxide, nitrogen oxides and carbon dioxide.

HAZARDOUS POLYMERIZATION: Will not occur.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

CARCINOGENITY: This product's ingredients are not found on the following lists: FEDERAL OSHA 2 LIST, NTP, IARC, CAL/OSHA.

IRRITANCY OF PRODUCT: Listed below are the potential reproductive effects which may occur after exposure to this product.

Mutagenicity: While no data exist for the product, this ink is not expected to cause any fetal toxicity problems related to mutagenicity.

Teratogenicity: While no data exist for this product, this ink is not expected to cause any fetal toxicity problems related to teratogenicity.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: There are no known chemical conditions, which would be aggravated by exposure to this product.

TOXICOLOGICALLY SYNERGISTIC PRODUCTS: None known.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms. No specific medical procedures are available.

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12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: Currently, there are no adverse environmental effects, which have been reported for this ink, except discoloration. All work practice should be aimed at eliminating environmental contamination.

EFFECT OF MATERIAL ON PLANTS OR ANIMALS: Animal studies on components of this ink indicate that it is a mild skin and eye irritant and moderately toxic by ingestion. No detailed studies have been performed for environmental effects.

EFFECT OF CHEMICAL ON AQUATIC LIFE: There are no reported adverse effects on aquatic life due to exposure to this ink. It is expected that this material will float near the surface of water and dissipate in a time-frame dependent upon the magnitude of the release and the movement of the water.

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13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This chemical, if unaltered by handling, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority. Discharge into a sanitary sewer or storm drain may violate local ordinance.

EPA WASTE NUMBER: Not Applicable.

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14. REGULATORY INFORMATION

TSCA INVENTORY STATUS: The chemicals in this compound ARE listed on the TSCA Inventory.

SARA Title III – Section 313, Emissions Reporting: Not applicable.

MARINE POLLUTANT: This product contains no chemicals which have been designated by the Department of Transportation to be Marine Pollutants in 49 CFR 172.101, Appendix B.

CALIFORNIA PROPOSITION 65: Proposition 65 requires manufacturers or distributors of consumer products into the State of California to provide a warning statement if the product contains ingredients for which the state has found to cause cancer, birth defects, or other reproductive harm. This ink contains no such ingredient.

CERCLA REPORTABLE QUANTITIES (RO): Not Applicable.

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15. OTHER INFORMATION

PREPARED BY: Digital Design, Inc.
67 Sand Park Road
Cedar Grove, NJ 07009

The information contained herein is furnished without warranty of any kind. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all other sources to assure proper use and disposal of these materials and the safety and health of employees and customers and the protection of the environment.